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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
- Where to Find the Western Gas Association's Exhibit and the Custodian Thereof at the World's Fair 921
- Twenty-seventh Annual Meeting, Western Gas Association..... 921

NOTICE—
- Congress of American Gas Associations..... 922

EDITORIALS—
- Briefly Told..... 922
  - Resignation of Mr. J. B. Grimwood—Law Seems to Rule in Indiana—"Newbigging's Handbook."
- *The Bronder Charging Machines at the New York City Gas Works 923
- Distributing Gas at 25 Pounds Pressure per Square Inch, by Mr. George Helps..... 923
- Rise of Electric Lighting in New England, by Mr. A. D. Adams..... 926
- *A New Slip Meter..... 927
- *Contents of the Question Box, Twentieth Annual Meeting, Ohio Gas Light Association—Continued from Page 892..... 928
- Electric Light and Power Plants in Connection with Ice Plants 931
- Jug Handled Labor Agreements..... 932

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 932
- Mr. A. C. Swain Leaves Kankakee, Ills.—Saying Good-Bye to Mr. T. D. Kehoe—Main Extensions, Toledo, O.—A Hint from Sherman, Tex.—Schreiber & Co., It is Now—Prof. Lowe and His Los Angeles Venture—Something from Mystic, Conn.—Ditto from Montreal, Can.—Death of Mr. George W. Davis—Mr. Wm M. Eaton Goes to Rochester, N. Y.—And Many Other Items.

- Concrete in the Baltimore Fire..... 933
- The Market for Gas Securities..... 934

[OFFICIAL NOTICE.]

Where to Find the Western Gas Association's Exhibit, and the Custodian Thereof, at the World's Fair.

To the Fraternity: The exhibit of the Western Gas Association, at the World's Fair, St. Louis, is located in Section 33A, Liberal Arts Building, where Mr. Fred. R. Persons, who is in charge of the same, will always be on hand to receive visitors and to explain anything that requires explaining.

[OFFICIAL NOTICE.]

Twenty-Seventh Annual Meeting, Western Gas Association.

OFFICE OF SECRETARY,
NEW ALBANY, IND., May 19th, 1904.

The Twenty-seventh Annual Meeting of the Western Gas Association will be held at St. Louis, June 14, 1904, and will be called to order at 10 o'clock A.M., by the President, Mr. F. H. Shelton, of Philadelphia.

The sessions of the Association will be held in the Hall of Congress, which is a part of the Administration Building, instead of in the Gas Exhibit Department, as heretofore published.

On June 15th and 16th will be held the sessions of the Gas Congress of all American Gas Associations, of which the Western Association is a member.

On account of the Western's session being limited to one day, the paper list will be as follows:

"Low Candle Power Gas," by Mr. William Henry White, of New York.

"Coal Projectors," by Mr. F. H. Shelton, of Philadelphia, Pa.

"Wrinkle Department," Edited by Mr. Wm. E. Steinwedell, of Cleveland, O.

The Western Gas Association will contribute the following papers, to be read at the Congress of the Gas Associations of America:

"Gas Inspection," by Mr. Ira C. Copley, Aurora, Ills.

"Station Meters," by Mr. Donald McDonald, Albany, N. Y.

"The Labor Question," by Mr. F. H. Shelton, Philadelphia, Pa.

Railroad Rates.—The railroads composing the various Passenger Associations have granted rates to St. Louis during the Exposition cheaper than those granted on the certificate plan. There are several classes of rates, as follows:

Central Passenger Association, covering the territory bounded on the North (with the exception of the State of Michigan) by the Great Lakes between Chicago and Buffalo; on the East by Pittsburg and Buffalo; on the South by the Ohio river; on the West by Chicago, the Illinois and Mississippi rivers.

Season tickets, good from April 15th to December 15th, 1904. at 80 per cent. of usual rates; 60-day tickets, 80 per cent. of usual rates, where single way tickets amount to less than $3.75. One and one-third fare for round trip where the usual one way rate is more than $3.75.

One and one-fifth rate tickets, good for 10 days for round trips from points from which one fare is $5 or more. The remaining Passenger Associations, comprising nearly all the territory outside of the Western

JUN 13 1904
SMITHSONIAN DEPOSIT.

Passenger Association, announce rates as follows: Season tickets 80 per cent. of double one-way rate; 60-day excursion tickets, 1½ fare for round trip; 15-day excursion, rate one fare plus $2 for round trip ticket.

The Southeastern Association, however, where the distance is more than 350 miles from St. Louis, charges one fare plus $2.25 for round-trip ticket.

A consultation with the passenger agents in the various localities will secure rates to St. Louis, with the privilege and restrictions imposed by the different rates obtainable.

The Hotel Jefferson will be the Association's headquarters, and Mr. E. G. Cowdery, Chairman of the Committee of Arrangements, announces that "The Committee will be represented at all times, in this location, by efficient help to be of assistance to delegates in any way they can."

The Committee of Arrangements announce rates at the various Hotels as follows:

Hotel Jefferson: $7 to $12 per day for room; privilege given for two persons to occupy a room.

Planters' Hotel: $3 per day per person; European plan. The hotel will place four persons to a room.

St. Nicholas Hotel: $7 per day and upward per room; European plan. Two persons privileged to occupy a room.

St. James Hotel: $7 per day per room, with privilege of two to four persons to each room.

The "Inside Inn," located upon the Fair Grounds, offers the following rates:

European Plan Includes Lodging and Daily Admissions.	Number of Rooms.	American Plan Includes Lodging and Daily Admissions.
$1.50 a day.....	500	.....$3.00 a day.
2.00 "	500	..... 3.50 "
2.50 "	500	..... 4.00 "
3.50 to 5.50 a day....	500 with bath	....$5.00 to 7.00 "

Single meals: Breakfast, 50 cents; luncheon, 50 cents; evening dinner, 75 cents. *A la carte* service at moderate prices.

Persons desiring to join the Association will have application blanks mailed to them upon application to the Secretary.

JAMES W. DUNBAR, Sec'y.

[NOTICE.]

Congress of American Gas Associations.

SECRETARY'S OFFICE,
58 WILLIAM ST., N. Y. CITY,
May 4, 1904.

The following Associations have agreed to participate in the Congress of American Gas Associations, to be held in St. Louis, June 15th and 16th: American Gas Light Association, New England Association of Gas Engineers, Western Gas Association, Pacific Coast Gas Association, Ohio Gas Light Association, Southwestern Gas, Electric and Railway Association, Michigan Gas Association, Wisconsin Gas Association, Kansas Gas, Water and Electric Light Association, Society of Gas Lighting, Guild of Gas Managers. The concurrence of all these Associations insures a successful Congress.

The following papers have been definitely promised:

"The Labor Question," by F. H. Shelton, Philadelphia, Pa.

"Gas Association Work," by Henry L. Doherty, New York city.

"Station Meters," by Donald McDonald, Albany, N. Y.

"Gas Inspection," by Ira C. Copley, Aurora, Ills.

It is intended to secure also either a paper, or a series of short papers, on the subject of "Inclined Retorts versus Horizontal Retorts Operated by Machinery."

Announcement as to Entertainment.—The sub-Committee on Arrangements for the Congress of American Gas Associations has planned to have, for the entertainment of the members of the Congress, a special entertainment on the "Pike," the evening of Wednesday, June 15th, and a banquet at the Hotel Jefferson the evening of June 16th. For the benefit of those who are not "posted," it may be explained that the "Pike" corresponds to the "Midway" at the Columbian Exposition in Chicago in 1893. The ladies will be given, on the afternoon of Thursday, a lunch and a ride round the Exposition grounds. Coupon tickets, each of which will entitle the holder to take part in the entertainment provided for members, and also entitle two ladies of his own family to take part in the entertainment provided for the ladies, will be sold to members of the Congress at the price of $5 per ticket. Extra tickets will have to be procured for ladies not included under above provision.

As the Committee must know at an early date how many are to be provided for, you will greatly facilitate its work by mailing to the Secretary at once the inclosed postal card, after filling it out, so as to show whether or not you expect to attend the Congress, and, if you are going to attend, the number of tickets that you wish to take. The sub-Committee is also having prepared special badges, which can be obtained by members of the Congress, that will undoubtedly be valued by them as souvenirs of the occasion.

A. E. FORSTALL, Sec'y.

NOTE the place of meeting change for the session of the Western Gas Association, as shown in the current official notice.

BRIEFLY TOLD.

RESIGNATION OF MR. J. B. GRIMWOOD.—With much regret, both on account of the cause and fact, we report the resignation of Mr. Joseph B. Grimwood from the dual office of Secretary and Treasurer to the Pacific Coast Gas Association. Ill health prompted his action, and it is certain that all who know him will share with us the hope that in short time he will be restored to the activity that was so markedly characteristic of him. A tower of strength to the Association, the real wearying details of which administration seemed never to burden him, it goes without saying that he will be sorely missed from its cabinet and by his brother administrators. Mr. John A. Britton has been appointed to carry on the duties of the position in the interim, which also goes to show that Mr. Britton knows no such thing as failure to respond quickly to the call of duty.

LAW SEEMS TO RULE IN INDIANA.—A correspondent in Indianapolis, Ind., writing under date of the 4th inst., incloses the following: "A decision denying the Consumers Gas Trust Company, of Indianapolis, the right to convert its natural gas plant to the point of enabling it to manufacture artificial gas was given this week by Judge Baker in the Federal Court, Judge Anderson concurring in the decision. Furthermore, it was held by the judges that the Company is not able longer to furnish natural gas because of the exhaustion of the field and that the assets belong to the stockholders who are the present certificate holders. All these points were in dispute as a result of the suit brought by Byron Quimby, of Massachusetts, one of the stockholders, who sought to restrain the Trustees and Directors of the Company from manufacturing artificial gas and from furnishing natural gas at a loss. Attorneys for the Trustees and Directors of the Company filed notice as soon as the decision was read that they would take an appeal to the Circuit Court of Appeals at Chicago. Bond was placed at $1,000. It is thought that the case will ultimately reach the Supreme Court of the United States. If the decision rendered yesterday is allowed to stand it will mean the dismantling of the Company's plant and a sale of its assets. Included in these are oil land leases and real estate valued at more than $2,000,000. In giving his decision Judge Baker pointed out that the Company had no right to engage in any business save that specifically stated in its charter. As the primary object of the Company was to furnish natural gas, it had no right to depart from it."

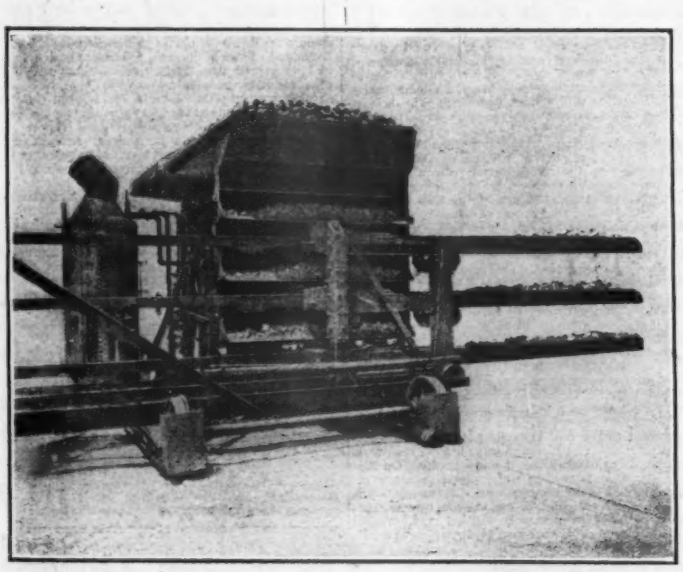
"NEWBIGGING'S HANDBOOK."—Through the courtesy of the publisher, Mr. Walter King, of London, England, we have received a copy of the Seventh Edition of "Newbigging's Handbook for Gas Engineers and Managers." This sterling work requires little comment from us to cause gas men to think well about it, for most of them know of it and are ready whenever a new edition appears to secure it for their collection of books that are often put to use from the reference point. The book as to get up is handsome in every respect and does credit to its publisher, who, however, seldom does things by halves. The following prefatory note to the Seventh Edition is from the well-loved author of the "Handbook," and bears date of Manchester, April, 1904:

"In order to keep pace with the improvements that are constantly being made in almost every department of the gas industry, it has been found necessary, in this, the Seventh Edition of the 'Handbook,' to extend the text, to rewrite various portions of it and to add a number of new illustrations. Special care has been taken to make the carbonization portion as full and complete as possible. But, indeed, in almost every department additional useful matter has been introduced. It is hoped that these efforts to bring the work up to date will be appreciated by readers, and help to maintain the high reputation of the book as a work of reference." The grand old author tells the story completely in that prefatory note, and all his aims respecting its worth have been successfully directed.

The Bronder Charging Machines at the New York City Gas Works.[1]

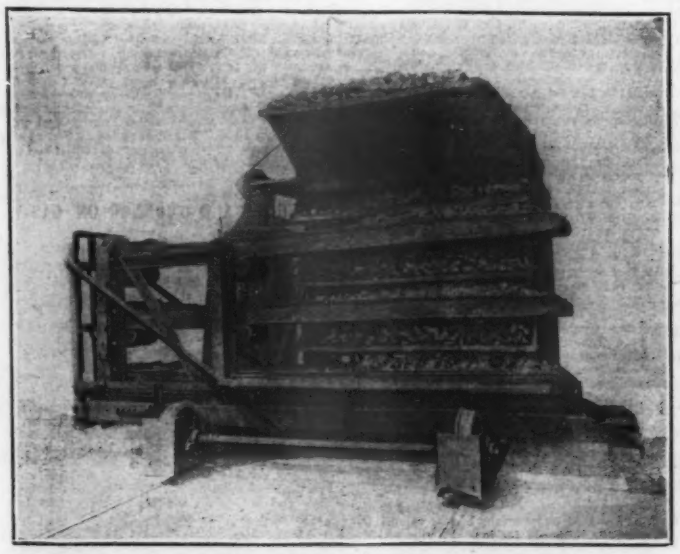
The question of retort charging machines is, nearly every mail brings some additional proof, exciting quite as much interest in America as it is in this country. The recent articles which have appeared in these pages dealing generally and particularly with the use of retort charging machinery "across the pond" have not only made that evident, but they have shown that the indigenous developments in retort machinery are of an important order. For substantiation, it is unnecessary to point beyond the charging of three and four retorts in one operation, which is a development as interesting to the gas engineer as the new forms of retort machinery in this country.

The best photographs of the 3-scoop type of Bronder machines so far obtained have been sent over by Mr. W. H. Bradley, the Chief Engineer of the Consolidated Gas Company of New York, who, it will be remembered, came to this country and the Continent last summer in connection with the huge gas works scheme his Company have lately entered upon. We are the more pleased with these photographs as Mr. Bradley, failing in several attempts to secure clear views of the machines in the retort house, went to the trouble of having one of the chargers run out into the yard, and, by providing a white background, has obtained fairly good results—better in the matter of mechanical and other detail than have been those published hitherto. The first



The Bronder 3-Tier Charging Machine at New York, Showing the Scoops Filled with Coal.

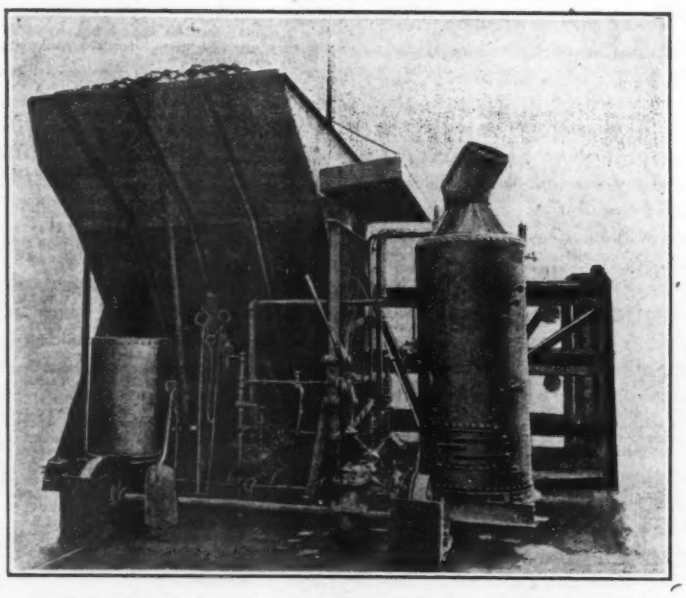
picture shows the machine with the coal in the scoops; the second,



The Same Machine with Scoops Extended.

with the scoops run out in position to drop the coal into the retorts; and the third is a back view of the machine. These machines, Mr. Bradley

1. *Journal of Gas Lighting.*



The Machine Viewed from the Opposite Side, Showing the Mechanical Details.

tells us, "are running steadily, charging 30 benches of sixes, or 180 retorts, every four hours. When the retorts are set in vertical line, there is no difficulty in charging three retorts at once; and with the later machines, designed for the settings of vertical eights, four retorts are charged at once." He adds that at one of the Company's stations a De Brouwer projector is in use. He saw this machine in operation during his visit to Europe last year, and had one sent over for trial, setting it up, in the first instance, in what might be termed an experimental way—charging the bottom retorts only of a range of beds in horizontal line. The machine is now being fitted up to take the entire range, but running on floor rails instead of being suspended from overhead rails. Mr. Bradley says he expects the machine to do very good work.

In a remark or two about his new works, our esteemed correspondent states that last winter was a very severe one; and this had the effect of forcing them to suspend all outside operations. They are, however, now getting fairly underway again. The first unit of 20 million feet capacity is well in hand, and Mr. Bradley hopes to be making gas there within two years' time.

Distributing Gas at 25 Pounds Pressure Per Square Inch.

By Mr. George Helps, Nuneaton, England.

In November, 1902, the Directors of the Nuneaton Gas Company, on the recommendation of their engineer, decided to lay about 5 miles of high pressure main to some outlying districts. Since then the whole of the main has been laid and the compressors and other apparatus put down, and houses are now being supplied with gas at 3 inches or 20 inches of water pressure, as desired. Any other pressure can be obtained on application, if certain conditions are accepted, as the main is under a pressure of anything from 10 pounds to 25 pounds per square inch. This, it is believed, is the first high pressure system on or near American lines that has been introduced into this country, or, in fact, into Europe.

In dealing with the subject it will be well to state that in these days by the term high pressure distribution is generally meant the sending out of gas into the district at a pressure higher than can be given by any of the gasholders employed, and to obtain which fans, compressors or other machines are used. The pressure in such mains may vary from 20 inches of water to 600 inches of water, or from about two-thirds of a pound per square inch to about 30 pounds per square inch.

Such a high pressure main may be used: (A.) As an auxiliary supply or feeder of low pressure existing mains in any particular district where an increased supply is required, without any intervention of district or other governors. (B.) As the direct and main supply to a district, a main governor or service governor being fixed at any particular point desired and the gas reduced to the pressure required by the district or by the individual consumer. (C.) As the direct and main supply to a district from which all services are connected and gas supplied to all consumers at the main pressure.

What had been done in America in 1900.—First of all it will be well

to briefly review what has been done in the direction of high pressure distribution in America. It appears that our cousins over the water are far ahead in this matter, as in some others. At the Gas Engineers' Congress, held in Paris in 1900, Mr. F. H. Shelton, of Philadelphia, read a paper on "The reduction of the cost of distribution by the use of high pressures" (*Gas World*, 15th September, 1900, pp. 398–402). After pointing out the fact that no improvements in distribution had been made during the last 20 years (he would have been quite correct if he had said 50 years) he states as the most striking feature the fact of gas being distributed at such an extremely low pressure as from 2 to 6 inches of water, and avers that it could just as well be distributed satisfactorily at pressures of from 10 to 30 pounds per square inch. Mr. Shelton then proceeds to say that the only instances among the thousand companies in the United States of which he had been able to learn wherein gas is compressed to any appreciable extent are the following:

Louisville, Ky.—Where a piston compressor has been used for 2½ years [now 6 years] pumping gas at the rate of 140,000 cubic feet per hour through 10-inch wrought iron pipe a distance of 2¾ miles at a pressure of 10 inches—this to supply outlying gasholders. The initial pressure was 5 to 7 pounds, to overcome the friction of the pipe while filling the holder against 10 inches at the other end.

Oakland, Cal.—Where a mixed coal and water gas has been pumped by a compressor for about 10 years [now 14 years] a distance of 8 miles, to Alameda, through an 8-inch pipe with lead joints, also for supplying gasholders. The initial pressure was 5 pounds, the holder throwing 4 inches. The loss of illuminating power is said to be a quarter of a candle.

Chicago, Ills.—Where for some years water gas has been pumped in the southern portion of the city through an 8-inch pipe a distance of 23,000 feet for filling an outlying holder. A rotary exhauster is used, of the Root pattern, giving an initial pressure of 10 pounds and passing gas at the rate of 60,000 cubic feet per hour into the holder against a pressure of 7½ inches.

Danbury, Conn.—For ten years past [now fourteen years] 35-candle oil water gas has been pumped under 40 pounds pressure through a 2-inch wrought iron pipe by a piston compressor a distance of three miles, into tanks from which gas controlled by a governor is supplied to the small town of Bethel at the customary low pressure.

In none of the foregoing cases have any consumers been taken off the high pressure main *en route*.

There are hundreds of natural gas companies in the United States supplying gas at varying long distances and high pressures, in connection with which governors are used.

Mr. Shelton proceeds to state that in 1899 he had an opportunity of trying high pressure distribution in connection with two towns—Phœnixville and Royersford, five miles apart, having a population of 16,000. He laid a 3-inch main for 23,015 feet (4 miles 631 yards). This main was tested to 60 pounds per square inch, and laid 3½ to 4 feet deep. A compressor was used having a capacity of 5,000 cubic feet of free gas per hour, the pressure to which the gas was compressed varying from 10 to 25 pounds, according to requirements. This main was used to supply the low pressure mains in the distant town, main governors being used. The loss of pressure by friction is stated to be from 2 to 3 pounds. Along the pipe lines several customers are supplied by means of individual house regulators reducing the main pressure to 17-tenths water pressure. One regulator controls a lamppost, another a large county almshouse, a third a run of 800 feet, serving 17 houses, a fourth the lighting of a bridge; and all these regulators have worked satisfactorily continuously. Mr. Shelton describes other towns about to take up the system.

And in 1902.—In March, 1902, Mr. Shelton, when discussing the subject of high pressure distribution [*Gas World*, 5th April, 1902, pp. 579–580] said that high pressure distribution at 10 to 30 pounds per square inch had come to stay; and he quoted the following additions to the system since 1900: Darby, Pa., where there were 20 to 30 miles of high pressure mains, supplying 1,000 consumers, a separate regulator being used to each. Riverton, N. J., where a 3-inch main was conveying gas four miles. Hackensack, N. J., where a 5-inch high pressure main supplied Rutherford. And Mr. Shelton added that he was then engaged in laying 30 miles of high pressure mains.

In April, 1902, Mr. Shelton's high pressure is again referred to in the *Journal of Gas Lighting*, in connection with the supply of New Orleans, a city having 287,000 population, and where 5 miles of 6-inch and 3 miles of 4-inch high pressure main had been laid to augment the low pressure mains. He figured the cost of compressing at 1d. per 1,000 cubic feet.

In May, 1902, in a written communication to the Ohio Gas Light Association, Mr. Shelton again refers to the pipes for high pressure being of one-third or one-fourth the low pressure sections, which means that instead of laying a 7-inch pipe a 3-inch or 4-inch pipe would do. He refers again to Phœnixville and Royersford, New Orleans, etc., and then states that the River Shore Gas Company supplies a district through 12 miles of 4-inch pipes.

The Philadelphia Gas Company supplies several villages by high pressure. The compressing costs, he repeats, are 1d. per 1,000 cubic feet.

In March, 1902, Mr. G. F. Goodnow, of Waukegan, Ills., gave some particulars of what he had done in high pressure distribution. This gentlemau is distributing gas through 14 miles of 4-inch wrought iron screwed pipe. He uses steam compressors and compresses the gas to about 30 pounds, at which pressure he reckons he can deliver 15,000 cubic feet per hour with a loss of 20 pounds pressure at the other end. He is only selling at present 40,000 to 50,000 cubic feet per day, equal to a yearly sale of about 8,000,000 to 10,000,000. He has about 440 consumers and 80 street lamps; 230 meters are controlled by 2 street governors and 240 are supplied by individual regulators. He was trying the street lamps at the full high pressure. The cost of compression was about 1d. per 1,000 cubic feet. He found the distributing capacity of high pressure quite double that shown by theory.

What has Been Done in England.—All that has hitherto been done on this side of the water consists in the augmenting of some low pressure mains, belonging to various companies and others, such as the South Metropolitan Gas Company, the Edinburgh and Leith Gas Commissioners and a few others, who are using what they call high pressure mains for conveying gas from, say, a gasholder on the works to a gasholder in an outlying district, at anything up to 10-inch or 12-inch pressure.

There is the ordinary high pressure system of lighting by means of water motors, such as Keith's, working at about 9-inch pressure, and various rotary machines, the most important of which is probably that working so successfully under the patents of Messrs. Sale & Onslow at the Woolwich Arsenal, and which has been supplying gas to burners for incandescent lighting at from 25 to 50 inches of water. Such pressures as these allow the unit of light to be very high; and with improved burners the unit of light can be also low. The one drawback to the supply at such a pressure appears at present to be the intolerable noise caused by the rush of air through the burner tube. Some people think that this noise is inseparable from high pressure lighting, but practice proves that it can be very greatly modified, if not altogether done away with.

Where oil gas is concerned, of course there are the Pintsch, Pope and other systems of high pressure, the gas being stored in cylinders at about 150 pounds pressure (or 10 atmospheres), and regulated by means of governors to about 1 inch of water. The thousands of these governors in use prove how eminently satisfactory they work. Mr. Fowler, Gas Engineer to the Midland Railway Company, remarked the other day that they did not have trouble with more than about 2 per annum on the whole of their system—a remarkable efficiency. Mr. Shelton also spoke most highly of them.

Having now told, as briefly as possible, what has been done in the direction of practical high pressure distribution of coal gas in America and in this country, it will be well to look into the advantages and disadvantages of this system—as to the practicability of which there can be no question—which were reviewed when the directors of the Nuneaton Gas Company inquired into the question of its adoption. The purpose of the high pressure main is that referred to under "B" (p. 939). If a high pressure main of 1 diameter throughout a whole district be laid and main governors be fixed, where convenient, to reduce the gas to any desired pressure for any convenient number of consumers, and single service governors fixed where required, no one can go very far wrong. This, as already stated, has been done in America with highly satisfactory results. Such a scheme will enable other improvements to be made—and there will be a large field for them—as familiarity with the new state of affairs is felt. There is no reason for so many governors to be fixed. Services could be taken directly off the high pressure main to supply special burners.

Advantages of High Pressure.—Some of the advantages, other than those of reduced costs, of high pressure distribution are:

1. That high pressure distribution is called for by the universal adoption of incandescent burners, and that it will enable all customers to be supplied with gas at any pressure to suit particular requirements, without the aid of pressure raisers. By pressure an improved duty per cubic foot of gas is obtained, amounting to nearly 50 per cent.

2. That high pressure gas lighting, though at present in its infancy, may be looked upon as the system of lighting at the present day, and that it is the most potent weapon with which to fight electricity.

3. That high pressure opens up the way to improved burners and more durable mantles.

4. That high pressure will enable burners or fittings to be constructed on far more artistic lines than low pressure allows. With it, for example, there is nothing to prevent a burner and globe being of nearly a similar size and shape to a 50 or 100-candle power incandescent electric lamp, or the production of a 2,000-candle light from a single burner within lamps of similar dimensions to those used for the electric arc.

5. That the carrying out of a small scheme will enable the system to be tested without any risk or loss of money, even if the unexpected happened—as it sometimes does—and it were wished to use the mains for comparatively low pressures. If a success the whole of the mains could very soon be supplied at high pressure.

6. That high pressure gas is by far the cheapest artificial illuminant known; and probably it will be found more economical for cooking, for heating, and for gas engines.

7. The mains and services can be reduced to about one-fourth of the size necessary with low pressures, and effect a considerable saving in expenditure; and if high pressure be made a direct supply the internal fittings can be run in boxes in exactly the same way as electric wires are.

8. A supply from the high pressure receiver could be run to any part of the town where an increased supply was required.

Disadvantages.—Some of the disadvantages of a high pressure system are:

1. The difficulty in obtaining reliable machinery in duplicate for compressing the gas.

2. The cost of main pipes, and of jointing same, to stand twice the pressure that will ever be put upon them.

3. The cost of reliable main and service governors and means of properly shutting off each service whenever required.

4. The difficulties of connecting up service and other pipes without interfering with main supply.

5. The necessity of having better fittings where high pressure gas is required.

6. The hissing noise occasioned at present when using high pressure burners.

7. The necessity, where high pressure is required, of increasing the strength of the meters, and probably having two dials to register the gas.

The Only Real Difficulty.—In practice it is found that the only real difficulty is the last of the above—that of the meter. It is well known that gas supplied at a few inches pressure takes up a certain space, and as the pressure is increased more gas will occupy the same space. For example, gas supplied as at present just overcomes the atmospheric pressure of 15 pounds per square inch. If the pressure be increased to 30 pounds absolute, or 15 pounds on the gauge, per square inch, 2 cubic feet of gas would be contained in the measuring chamber of the meter, which would mean that if gas were sold at 3s. 6d. per 1,000 cubic feet at low pressure, it would have to be charged at 7s. per 1,000 if supplied at 15 pounds above atmospheric pressure. The best way of dealing with this question has not yet been discovered, but one way would be to adopt a certain range of pressures at which gas could be supplied by governing down for the various districts. This would necessitate a different meter index for each separate district, and arranging the price accordingly on the basis of the low pressure charges, having a dial on the meter to register the high pressure gas at the low pressure value. In this way the gas passed at high pressure would be registered and paid for exactly as if it were passed at a low pressure. This may appear, at first sight, a little complicated; but as there are certain absolute values for pressures no trouble should be entailed in this direction. Of conrse, if all the gas used off the high pressure main were governed, the gas would all be supplied at low pressure and the present meters used, but because high pressure gas will be welcomed so soon as it is allowed to be familiar, this difficulty is here mentioned.

Reliable machinery can be obtained, as also main pipes, etc., the cost of regulators is not high, and the extra cost of high pressure meters should be but a few shillings.

Testing Pole's Formula.—When the Directors of the Nuneaton Gas Company considered the matter, it was calculated by the ordinary formula that a cast iron low pressure main 10,000 yards long, to have a capacity at its extremity of 5,000 cubic feet per hour, would require a pipe of an average diameter of 7 inches, the inlet pressure at works being 30-tenths; and that the cost of such main, laid complete, would be approximately £4,500. And it was considered that a Mannesmann steel main at 5 pounds pressure per square inch would practically require for the same distance an average diameter of 3 inches, the estimated cost of which was figured as £1,800 (compressors, etc., being taken to cost £550 extra). But as it was reckoned that the formula on which this calculation was made was not reliable for high pressures, it was decided to lay three miles of 3-inch main and test it for capacity. As a matter of fact, the test was made with 4,250 yards laid; when it was found that, according to Marsh's rotary meter, the following quantities were passed:

	Cubic Feet Passed per Hour at Extremity.
Pressure 5 pounds per sq. in. on 3-inch main, 4,250 yds. long	5,700
" 10 " " " " " " "	9,600
" 18 " " " " " " "	18,000

Or, roughly, 1,000 cubic feet per hour for every pound pressure.

Dr. Pole's formula would work out as follows:

	Cubic Feet at Extremity.
Pressure 5 pounds per sq. in. on 3-inch main 4,250 yds. long	5,953
" 10 " " " " " " "	8,383
" 18 " " " " " " "	11,300

So that if these tests are at all reliable, Dr. Pole's formula is not far wrong up to pressures of 10 pounds.

The axiom that the discharge of gas is doubled by the application of four times the pressure appears to be a false one. Dr. Pole's formula does not altogether support it. Again, it has been remarked many times, on the other side of the water, that mains are double their theoretical capacity at high pressure. Probably this will be found correct at 25 pounds pressure. There is no known reason for doubting the veracity of the rotary meter through which the gas passed on its way to the compressors; but perhaps someone may throw light on the subject. It can, of course, be understood that the mains would be double the above capacities if gas were distributed *en route*, but surely Dr. Pole's formula is for gas delivered at the extremity of the main.

The Nuneaton Installation.—The first portion of the main having been tested for capacity and the advantages of supplying gas at high pressure (25 pounds) proved, it was deemed unnecessary to continue the 3-inch main, and so 2-inch, 1¼-inch and 1-inch was laid for the remaining portion, and the main now actually laid and in use is:

5,168 yards	3-inch.	Mannesmann tubes about 30 feet long, socket and spigot.
1,727 "	2 "	W. I. with R. and L. hand threads.
800 "	1¼ "	" " "
938 "	1 "	" " "

What this main is capable of supplying throughout its length cannot be estimated, for will it not be largely governed by the soundness of the joints (which must limit the applied pressure) and the capacity of the compressors at the gas works' end? These are points that should not be overlooked. The condensing out of hydrocarbons need not be considered of importance, when the world is within view of the arrival of low grade gas.

The cost of laying the whole of the mains, including compressors in duplicate capable of dealing with 10,900 cubic feet per hour and compressing it to 40 pounds per square inch, 100 yards of 4-inch condensing main and water trough, high pressure holder of 15,000 cubic feet capacity, reducing valves, meters and special connections in works, two rotary meters and inspection chambers in district, and sundry apparatus, has been £2,725.

It should be stated that the first three miles of main were laid in the winter under very unfavorable conditions, and that an air compressor had to be rigged up to test the main, and several delays were caused by distance and by unfamiliarity with the new conditions.

It must also be stated that the compressors were put down of considerably greater capacity than at first estimated for, as on consideration it seemed advisable to do so, and to allow of high pressure mains being laid to other parts of the town in the future for feeding or other purposes. For all ordinary uses a high pressure main may be reckoned as about one-third the cost of low pressure mains, exclusive of compressors.

Early Troubles.—With regard to the mains there was no trouble in setting up the lead in the joints to stand 60 pounds per square inch air pressure, but when 30 pounds gas pressure was applied the leakage was found to be about 4,000 cubic feet per hour (low pressure gas), and it was found necessary to examine all joints, each of which was slightly leaky; so that there was nothing to do but open up and recaulk every

one of them. After this was done the leakage was reduced to about 500 cubic feet of low pressure gas per hour. How this trouble arose is a little obscure. Certainly the test applied as the main was laid cannot have been a satisfactory one. The steam roller may have had something to do with it. However, the leakage since has been inconsiderable, as, including all the known heavy losses of gas, the leakage account for the year per mile of gas main is less than it was before the high pressure main was laid, and it had been at work for eight months of the calculated year.

There can be no question that the jointing and bedding of the pipes, as well as the depth at which they are laid, are matters of the utmost importance. Oil was found useful for testing the joints. All flange connections require to be truly faced, of course.

The testing of the compressors was a little difficult, owing to there being no reliable meter for measuring the quantity of gas compressed. A small holder with a carefully marked capacity would have been useful.

The high pressure holder entirely removes the oscillation caused by the working of the compressor. The tapping of the main under pressure and the connecting of services, house regulators, vents and meters is simple enough. The costs of compression are difficult to assess, but 1d. per 1,000 cubic feet appears to be far too high a figure to take.

Successful Working.—High pressure distribution, apart from the advantages of its allowing a better duty from existing or special high pressure burners, smaller internal pipes and more artistic fittings, has still greater advantages. A mile of ¾-inch tube only costs about £70 laid, and will deliver at its extremity, with 10 pounds per square inch pressure at the near end, nearly 1,000 cubic feet per hour. Thus the area of supply can be economically increased and good consumers supplied. Further, with such a surplus of pressure at hand, there can be no difficulty in working a mixing apparatus after a high pressure meter, so that at the burner head a mixture of gas and air can be provided, and so do away entirely with unsightly burner tubes and the roaring noise we hear so much of, both with lighting and heating burners.

Generally the whole scheme is extremely successful, and it is calculated that the trouble and expense it caused will be repaid many times over. At present the main supplies about sixty consumers, including the Midland Railway Company at Stockingford engine sheds, where there are over 400 lights. The consumers are most pleased with the supply and no great difficulty has, so far, presented itself.

Any members of the Midland Association of Gas Managers, or of any other Association, who visits Nuneaton on 2d June will be able to see any details of the mains and apparatus they may be interested in.

Rise of Electric Lighting in New England.

By Alton D. Adams in *Elec. World*

Charles Francis Brush exhibited a four-lamp arc dynamo at the Mechanics' Fair in Boston during October, 1881. On November 9, after the Fair, this dynamo and lamps began to operate in a building occupied by the Continental Clothing House, at the corner of Howard and Washington streets. This was the first electric light plant installed for regular service in Boston, and probably in New England.

Much light is thrown on the state of the art at that time by the construction of this dynamo and lamps, which Mr. Brush thought of sufficient importance to warrant their exhibition by him in person. The armature core was a cast iron ring with wide slots to receive the coils in radial directions on its two sides. There were eight of these slots on each side of the ring, and it was wound eight coils or bobbins as they were called. Diametrically opposite coils were connected in series, and the four pairs of coils thus formed had the two free ends of each brought out to a two-part commutator ring. Each of the four commutator rings was electrically independent of the others, and from each ring two bare No. 6 wires were carried to a single arc lamp. Independent commutators were necessary on this dynamo because the arc lamps had no automatic cut-outs, and when the carbons in any lamp had burned out its circuit was completed through only the fine shunt winding. Bare square carbon rods were used in these lamps, and their cost was 25 cents each.

The electric arc thus brought to public attention in Boston was soon seen at other points in New England. Isolated plants naturally come first, and then central stations for general lighting. One of the earliest, if not the first public lighting system in New England, was that using the United States series dynamo and arc lamps in New Haven, Conn., which began to operate on July 4, 1881. The next year was one of much activity in the promotion of lighting from central stations, and equipments were installed for this service at Portland, Me.; Manchester, N. H., and Lowell, Lawrence, Lynn, Salem, Taunton and Springfield, Mass., in 1882. At Manchester the first plant comprised 10 Weston arc dynamos with a capacity of ten lamps each, and was operated with rented power in one of the mills of the Amoskeag Manufacturing Company.

The Portland Electric Light Company had one small arc dynamo driven by a simple engine, and began to supply light in that city during February, 1882. In Lowell the first public lighting system was preceded by a plant of a Brush dynamo and ten arc lamps in the clothing store of Putnam & Son, on Central street, which was started in operation about May 1, 1882. Later in the same year a company was formed for general lighting service, and three Weston arc dynamos with a capacity of ten lamps each were installed in the basement of Davis & Sargent's mill for this purpose. Circuits from these dynamos were run along Middlesex and Central streets, where 30 arc lamps were hung, and the plant went into operation on the day before Christmas, in the year just named. The Middlesex Electric Light Company was formed and installed a public system of arc lighting with Thomson-Houston dynamos and lamps at Lowell in 1883, and this company was soon consolidated with the one that had preceded it. Some time after this consolidation the capacity of the lighting system was increased by the addition of a 600-lamp, 110-volt, Thomson-Houston dynamo for incandescent service.

Lawrence was the site of the first Edison three-wire system in the State, and probably in New England, the company for the installation of the Edison system there having been formed in 1882. In the same year the Lawrence Electric Light Company was formed for the operation of the Thomson-Houston system of arc lighting there, and both of the companies began their service before the end of the year. Some years later both of the electric companies sold their systems to the Lawrence Gas Company.

The Salem Electric Lighting Company began operations, in 1882, with the Thomson-Houston arc light apparatus. In the same year the Lynn Electric Lighting Company began service in that city from a Thomson-Houston dynamo that was driven by rented power in a shoe factory on Market street, nearly opposite the station of the Boston, Revere Beach & Lynn Railway. A little later the plant of the Lynn company was moved to Stewart street and provided with its own steam plant. In 1888 the gas and electric companies at Lynn were consolidated under an act of Legislature. Electric lighting was begun at Springfield in 1882 by the Blair Manufacturing Company, with Thomson-Houston arc dynamos and lamps. The plant thus started was subsequently secured and operated by the Springfield Electric Light Company, and in 1887 the entire system passed into the hands of the United Electric Light Company.

Every one of the first electric lighting systems just mentioned, with the single exception of the Edison at Lawrence, had been equipped at the start with only arc dynamos and lamps. In the following years incandescent lighting claimed a large share of attention. The Pearl street Edison station in New York had been started in September, 1882, and was a striking example of what could be done in the multiple operation of incandescent lamps.

In May, 1883, the original Fall River Electric Light Company started its plant of one Thomson-Houston arc dynamo with power rented in a machine shop in that city. October of the same year saw an Edison station equipped in Fall River with its three-wire circuits entirely in underground tubes. In 1896 these two companies were consolidated under the name of the former. An Edison company was also incorporated for operation in Brockton during 1883, and subsequently absorbed an arc lighting system operated there by another company.

This year of 1883 marks the beginning of electric lighting from central stations in Boston, and two companies then started their plants. One of these plants operated with the Brush arc dynamos and lamps, and its first machines were located in Ham's Iron Works on Portland street. From this plant the first arc street lamps in Boston were operated. After a few months the dynamos of the Brush system were moved to a station on Lancaster street, and still later to the well-known Ferdinand street station. In the same year that the Brush Company began operations, the Merchants Light, Heat and Power Company rented a space in the basement of the Mechanics Building on Huntington avenue and installed a 10-lamp Thomson-Houston arc dynamo driven by a small high-speed engine for general commercial lighting. This plant was soon made larger, and in 1885 was moved to 197 Congress street.

The Massachusetts Electric Power Company was formed in the year last named, and installed, at the Congress street station of the Merchants Company, the first dynamo ever used in Boston for the distribution of current exclusively to electric motors. This dynamo was of the Daft make, rated at 50-horse power and about 110 volts. Steam power was rented from the engine of the Merchants Company to operate this Daft dynamo, and it is related that the engineer of this company would watch for the greatest loads on the Daft machine and then take cards from his engine to determine the basis on which the power used was to be computed. The power company operated only motors with their Daft dynamo, as it was thought impracticable at that time to supply both incandescent lamps and motors from the same machine. In this 50-horse power, 110-volt Daft dynamo of 1885, with its two-wire circuits to nearby motors, might have been read the prophecy of the great electric motor load in Boston at the present day, but those most interested saw it not.

In 1884 another company, the New England Weston, entered the arc lighting field at Boston with dynamos and lamps of the Weston make. These three arc lighting companies, the Brush, the Merchants and the Weston, operated in competition until about 1887, and were then consolidated in the Boston Electric Light Company, which was formed for the purpose. In this consolidation there was also included the power company that had started with the Daft dynamo.

During these hard, early years of competition capital did not flow to electrical enterprises as readily as it does now, and some amusing incidents are related of the financial straits to which the companies were sometimes put. Its contract for street lighting gave the Brush Company a degree of opulence not enjoyed by the others, which had to rely solely on their commercial business, and this led to a prodigal rejection of rather long carbon stubs by the trimmers of the street lamps. Knowing of this habit and also of the limited resources of their own employer, the trimmers of the Merchants Company were wont to go about under the Brush street lamps and gather the rejected carbon stubs for their own use. It is even said that there were times when the operators at the Merchants station were obliged to go out and buy oil with their own money to prevent shutting down the machinery.

The company had a contract with the Hotel Brunswick to supply an arc lamp outside during the evening and also a contract with the Adams House to operate an arc lamp inside during a part of each day. Having only one arc lamp that could be devoted to both of these hotels, the employees of the Merchants Company were obliged to carry this lamp back and forth every day. Sometimes when a day was darker than usual it required no small degree of strategy to get this lamp to the Brunswick early enough and yet not take it away from the Adams House too soon.

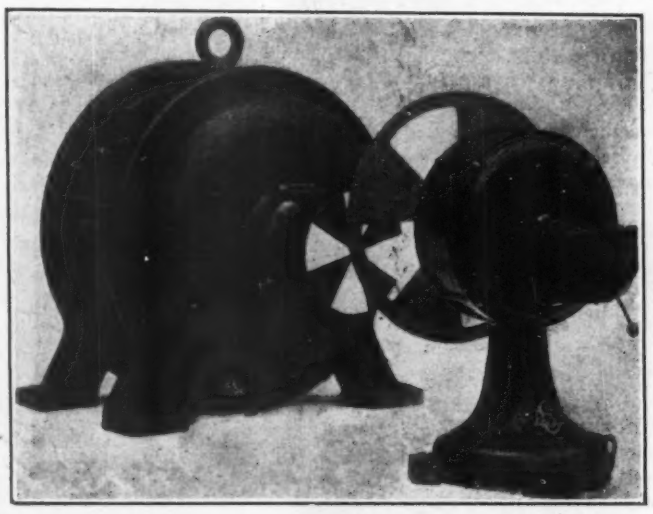
On December 31, 1888, the station bounded by Summer street, Gilman Place and the water front, which had been built by the Boston Electric Light Company to care for the consolidated business of the earlier companies, was started. The station of the Weston Company, on Stanhope street, was continued in operation as part of the Boston system until 1893, and was then abandoned. The Ferdinand street station was also continued in operation, and though burned down in 1893 was at once rebuilt. From 1898, when the L street station was started, to 1902, when the Boston electric system passed into the hands of the Boston Edison Company, the Ferdinand street station did duty in the distribution of current from L street, and was abandoned in the latter year. In 1894 the Boston Electric Light Company equipped its station on Boston street with apparatus that had been exhibited at the World's Fair in the previous year. After 1898 the energy for the Boston Electric Light system was generated at its last, best and largest station on L street.

A New Slip Meter.

Mr. Franz Welz, writing in *Elec. World*, notes that at a recent meeting of the German Institute of Electrical Engineers, Mr. G. Benischke, chief electrician of the Allgemeine Elektrizitäts-Gesellschaft, gave a description of his new apparatus for measuring the slip of induction motors. This effect is determined by the formula, $s = \frac{u_1 - u_2}{u_1}$, where u_1 is the number of revolutions of the rotating field and u_2 the number of revolutions of the rotor. As the difference between these two values is generally very small, the correct determination of the slip is quite difficult, and small errors in taking the above mentioned values affect the result very largely. Mr. Benischke had, therefore, indicated a method which allows a direct reading of the difference, $u_1 - u_2$, in making use of the so-called "stroboscopic" effect well known in physics.

According to this method, the shaft of the rotor is provided with a disk which is divided in several black and white segments. This disk is lighted by an arc lamp, which is fed through the same distribution system as the induction motor. The number of passages of these segments before a fixed point in a certain time allows the determination of the difference $u_1 - u_2$. But in addition it is still necessary to know the number of cycles of the current, or the number of revolutions of the generator. In many cases it is not advisable to use an arc lamp on the circuit, as it results in an unequal distribution of current in the three phases on account of its high amperages. In using an incandescent lamp, this stroboscopic effect is only visible in a darkened room.

From this method Mr. Benischke has developed a very simple apparatus which permits the determination of the slip in a convenient and absolutely accurate manner. No light source is necessary, nor is a record of the time to be made; neither does it require a special instrument for determining the number of revolutions. The appparatus (see illustration) consists of a small 3-phase synchronous motor, which



Slip Meter.

is self starting and reaches synchronism very quickly. A disk, from which a number of segments is cut out, is attached at one end of the shaft and on the other end there is a counter, driven by rack and pinion, which can be thrown in and out by a little lever. A stroboscopic disk is attached by means of wax to the shaft of the induction motor to be tested. This disk consists of black and white segments of the same number as on the disk on the synchronous motor. The latter motor is put at a certain distance from the induction motor, and if both are running and the observer looks through the disk of the synchronous motor upon the other disk, the segments seem to rotate. The number of passages before a fixed point can be counted very easily, and this gives the difference $u_1 - u_2$; the number of revolutions of the rotating field, u_1, is given simultaneously by the counter. The value of the formula above given is not dependent on the time, and it is, therefore, of no importance for which period of time the values $u_1 - u_2$ and u_1 are taken; the only condition is that only values taken at the same time are to be compared. It is, therefore, not necessary, as in the case of the method of illuminating the disk or with other methods of counting the pulsations of current in the rotor, to record simultaneously the time, all that is necessary being to count the numbers of passages of the segments and read from the counter of the synchronous motor the number of revolutions during that time. The quotient of the first value by the latter gives the slip of the motor.

The simplest arrangement is that in which the disk of the synchronous motor and that of the induction motor have the same number of segments, and it is best to use for this number the number of poles of the induction motor to be tested. In order to get actually the difference $u_1 - u_2$, it is necessary to divide the observed number of passages of the segments by the number of the segments on the disk of the induction motor. If the slip is very large, the segments turn too quickly to make it possible to count the number conveniently. In this case it it best to employ a disk with only one segment; the observed number of passages is then equal to the number of "slipped" revolutions. This involves another advantage compared with the method of counting the number of pulsations of current in the rotor. These pulsations follow each other so quickly in the case of a large slip (commencing at about

0.06) that they cannot be counted with any accuracy; with this new apparatus the number of slipped revolutions can be counted directly by employing disks with only one segment. In order to obtain good results it is necessary to place the synchronous motor at a greater distance from the induction motor than is shown in the illustration, as the stroboscopic effect is better visible in proportion as the distance increases.

[Continued from Page 892.]

Contents of the Question Box as Read at the Twentieth Annual Meeting, Ohio Gas Light Association, Cleveland, O., March, 1904.

No. 10. "At what temperature does carburetted water gas leave the superheater?"

"Between 1,500° and 1,400° F., depending upon temperature of the apparatus.—M. N. LATTA."

"Carburetted water gas leaves the superheater at a temperature of about 910° F. This temperature was taken at a point on the off-take pipe 2 feet from superheater shell.—E. P. GARTLAND."

No. 11. "Would not split brick be better for checkerwork in the carburetter and superheater rather than regular sized brick?"

"Regular sized, straight brick well-burned, give the best results in carburetter and superheater.—CHAS. F. CATTELL."

"With split brick we would have twice the heating surface with the same annular space, and could, therefore, use twice as much oil in our carburetter.—W. S. BALDWIN."

"This question, it would appear, demands knowledge of the ratio between total volume of gas passage and total volume of brickwork; brick volume itself must be taken in connection with surface of brick exposed to the flow of gas, and the whole thing would hinge on the particular oil to be used. As this latter is always variable, it would strike me that the only practical course is that already adopted, under which sufficient brickwork is provided to handle the heaviest oils at proper temperature, and provision for the handling of the lighter oils is made by regulating the temperature of the brickwork and the rate of the flow of gas.—HENRY I. LEA."

"Split brick might do as well as the regular size brick in the superheater, but would not do at all as well in the carburetter. The fact that the first four or five rows on top of the carburetter get badly broken up by the oil falling on them, would make it impracticable to use split brick. I cannot see there is anything gained by using them in either place, because, though the split bricks are cheaper per thousand than the regular brick, yet more must be used in covering a given area, making the cost in the long run greater for the split brick; besides, they would have to be renewed more often than the regular brick. Below are figures on 100 square feet of area with spacing of 2 inches: No. 1 firebrick, 346½; split brick, 453; cost of No. 1 brick, $7.97; cost of split brick, $8.83. Showing a difference in favor of the regular No. 1 brick of 86 cents per 100 square feet of area.—J. T. MASON."

"No. However, in small settings the smaller brick are better for carburetter, insuring a better breaking up of the oil and preventing a likelihood of settling at bottom of carburetter. As these bricks become filled up quickly, they can be removed and new ones replaced. The large bricks in superheater are better, as they last longer, hold heat better, and can be placed far enough apart to insure free passage of the gas, and still contain heat enough and hold it long enough to thoroughly fix the gas. The large machines are generally checkered with full size bricks in both chambers.—E. M. OSBOURNE."

"Split brick for checkerwork would, of course, give greater heating surface for a given volume of brick than the ordinary No. 1 brick. 'Soap' brick, which is one-half the depth of a No. 1 brick, is sometimes used for this reason. It is probable that either of these two forms of brick is weaker and less durable than the No. 1 brick, and its use not desirable, unless for very special reason.—ANONYMOUS."

No. 12. "What gas companies now use charging and drawing machinery?"

"Ross machines are or have been in use at the following points: Boston, New York, Cleveland; Philadelphia, charging machines only; Milwaukee, Indianapolis, drawing machines only; Cincinnati carbonizes all coal with this type of machine, both charging and discharging.

"Bronder machines are or have been in use in this country at the following points: Consolidated, New York, charging, 3 at West 18th st. works, 2 at East 14th st. works; discharging at these points is done by Ross machines: Consumers of Toronto, Can., three charging and 3 discharging machines. U. G. I. Co., Point Breeze, Phila., three charging and 3 discharging machines; 25th Ward works, Phila., three discharging machines; Ross charging machines in use at this point. Market street works, Newark, N. J., three discharging machines; Mt. Vernon, N. Y., two charging and 2 discharging machines; Montreal (Can.) Company, two charging machines: Worcester (Mass.) Company, two discharging machines; Detroit Company, Detroit, Mich., two 4-tier charging machines, two 4-tier discharging machines.

"Arroll-Foulis machines: Discharging machines in use at two works of Cleveland (O.) Gas Company, also at the old Buffalo (N. Y.) City Gas Company's works.

"No West machines are as yet in use in this country, but are contracted for and being installed at Milwaukee, Lowell, Mass., and New Haven.—R. B. BROWN."

No. 13. "What blast pressure should be carried on a water gas machine?"

"Ordinarily from 18 to 22 inches.—HENRY I. LEA."

"Eighteen to 20 inches blast pressure should be carried on a water gas machine. If a lower pressure is carried, the generator will produce more CO than will be required to heat up the carburetter and superheater, and consequently fuel will be wasted. With a higher blast pressure, the economy produced in the generator is counterbalanced by the power required to run the blower.—E. J. SHERWOOD."

"Fifteen to 18 inches blast pressure. Study your machine and run with pressure that gives best results. All machines do not 'heat up' the same with a given blast pressure.—CHAS. F. CATTELL."

"From 14 to 16 inches of water pressure is usually carried on a water gas machine.—FRED. H. BECK."

"The blast pressure on the generator should be between 15 and 18 inches, coal being used; 12 inches to 15 inches for coke. A lesser pressure fails to carry over the secondary products of combustion from the generator, the entire consumption being carried on there and creating an undue strain of heat upon the lining of the generator without distributing the combustion of gases throughout the other retorts, which are thereby insufficiently supplied with fuel.—M. N. LATTA."

"The answer to this question will depend on conditions and kind of fuel used in the generator. I should recommend a short and hard blast. With the fuel that is used in Milwaukee, which is our own coke, varying from pea coke to coarse, we use on the 11-foot set 18 to 20 inches pressure. On the 9-foot 6-inch set, we use 12 to 13 inches pressure.—J. T. MASON."

"The matter of blast pressure on a water gas machine is probably more directly associated with the amount of gas made than any other single factor. My experience has been that while 10 or 12 inches will give fairly good results, increasing it to 18 or 20 inches will give an immediate increase of 4 to 5 per cent. in the make and without any other change. In order to keep the fuel consumption down as well, and get the very best results, it will be found necessary in increasing the blast pressure to also reduce the time on both runs and blasts. On the other hand, letting the blast pressure reduce down to 6 or even only 8 inches will almost immediately be shown in poor make and lessening candle power and increase of oil and coal per 1,000. The matter of blast pressure is so important that the gas maker should have a gauge on the blast easily and constantly in sight and in good working order, and be required to record his blast pressure on his running sheet for every blast. To increase the blast pressure in any particular plant, it will be necessary to either increase the speed of the blower, or, if the limit of safe working speed of the blower has been reached, the only alternative is to get a blower of larger capacity. In case a blower is installed, care should be taken to be sure that the blast pipes are not too small, as a blower will not give good results with too small a system of piping. It does not pay to try to run a blower much beyond its rated speed, as none of the parts, bearings, fan or shell, are designed for such increase, and trouble is sure to follow.—J. S. DIXON."

"Opinions differ. From 18 to 20 inches water pressure is good practice, though recent tendency has been toward higher and higher pressure, until even 24 inches is often used. By actual test some years ago I found that best results came by manipulating blast pressure; admitting only 6 to 8 inches at first, and gradually increasing until about 20 inches had been reached. When about 5 minutes of the 8-minute blast which we were then using were up, we blasted about 3 minutes at full pressure.—E. M. OSBOURNE."

"Twenty inches blast pressure should be carried on a water gas machine.—E. P. GARTLAND."

"The blast pressure required in a water gas set will depend upon the kind and quality of fuel and its depth, the condition and spacing of checkerbrick and upon the design of the set. In general, with the Lowe apparatus of modern design, fuel bed 6 feet deep, checkerbrick spaced 2 inches, the pressure required beneath the grate will be from 16 to 20 inches. This will allow a drop in pressure from bottom to top of fire of from 5 to 10 inches; coke, either gas house or oven, of good quality, will probably require less difference in pressure between the bottom and top of the fire than anthracite coal.—ANONYMOUS."

"In considering what pressure should be carried on a water gas machine, a distinction should be made between total pressure on the machine and differential pressure between the bottom and top of the fuel bed. The amount of CO left in the blast gases depends upon the velocity of air through this fuel bed. Velocity will not vary greatly if a certain drop in pressure is allowed per foot of fuel depth. Congestion in the superheater or carburetter, or the connections between the various shells, affects only the quantity of the power consumed, if a given quantity of air is used, or affects only the volume of air passing through the fuel if the power remains constant. Two water gas machines might be working at the same total blast pressure, one of them having a drop of 1 inch of pressure per foot of fuel in the generator, while the other would have a drop of only ½ inch of pressure per foot of fuel in the generator. Therefore, any rule given for the pressure at which to operate a water gas machine should be in terms of drop in pressure through the fuel bed.—EDITOR."

No. 14. "What difference in pressure should there be between the top and the bottom of a 6-foot fuel bed in a water gas machine?"

"If the bed is clean, the variations are 6 to 8 inches, according to depth.—FRANK LANGWITH."

"There should be about 4 inches difference in pressure between the bottom and top of a 6-foot fuel bed in a water gas machine when using coke for fuel. Since the quantity of air passed in a given time depends upon the differential pressure, a smaller difference than 4 inches would not allow a sufficient volume of air to pass through, and too much CO would be formed. If a larger difference in pressure occurred, it would indicate that the blast gases were passing through the carbuaetter and generator too easily and too much heat was being carried away which should be used in heating them up.—E. J. SHERWOOD."

"With coke reasonably free from impurities and handled properly a differential of from 5 to 7 inches should be found in a 6-foot fuel bed. —HENRY I. LEA."

"There should be a difference of 5 inches pressure between the top and bottom of a 6-foot fuel bed in a water gas machine.—E. P. GARTLAND."

No. 15. "Can coke be best quenched with a hose or a bucket?"

"Coke can be best quenched with a bucket, as the water is thrown on in larger quantities at one time, and this allows the water to penetrate in the coke, therefore there is less steam rising from the coke this way than by using a hose. A hose will only throw a small stream which has a tendency to cool the outer surface but not the inside, and consequently there is more steam rising, which interferes with men at work on the retorts.—C. A. LUTHER."

"It is the writer's experience that stokers prefer to quench coke with a bucket and make a better job of it.—WALTER M. BLINKS."

"We find that a spray or a bucket is much better than a hose. Where the retorts are pulled by hand, buckets are used. Where 1,300 pounds of coke are pulled in 20 seconds, a spray is used. In the latter case a drawing machine is used.—W. S. BALDWIN."

"The recent practice at our works has been to quench with the hose, and if care is taken we see no objection to its use.—ALTON LIGHT & TRACTION CO."

"Coke is best quenched with a bucket, as it saves time, and, in case water is paid for by the gallon, it is much cheaper, as less water is used.—WM. H. KERIN."

"Coke can best be quenched by water thrown from a bucket, because the employee will not waste as much time and is not so liable to wet the coke too much.—B. F. BULLOCK."

"I have seen, thousands of times, a man sitting on top of a ptle of coke, squirting water over that which was falling from an overhead trap door, as it was being drawn from the retorts. That is all that that man did until the 'draw' was over. If the man could do nothing else while the draw was going on, that was a good enough way, for as soon as the draw was finished the coke could be shoveled back on the pile and be gotten out of the way. At the same time the hot steam ascending from the quenched coke did not add to the comfort of the man on the floor above, and I have more than once seen men knocked over on a hot day who could have stood very well but for the steam mentioned. A better way, in my opinion, is to wait until the draw is finished (in a stage floor house), and then a few well directed bucketfuls of water will quickly and effectively quench the coke without inconveniencing anyone; besides, when the quencher has to use the bucket, he is not likely to 'drown' the coke to be quenched. Not to draw this out too long, I hold that in a works without automatic coke quenching devices, bucket quenching is distinctly a better way, both as to economy in water, labor, comfort of the men and quality of coke. In a 'round floor' retort house, bucket quenching of the coke seems to be the only admissible and common sense method, which seems to be a self evident conclusion.—FREDERIC EGNER."

"Quenching water should be uniform in amount and application.—H. L. RICE."

"Our experience has been that we can quench coke better with a bucket than we can with a hose, unless one man sprinkles with the hose while another man draws the coke from the retorts. The coke seems to blacken when exposed to the air before cooling, and the quicker it is quenched the better looking coke we have. The bucket distributes water over the surface of the coke quickly and evenly, and chills it before it has very long exposure to the air. We also seem to use less water when quenching coke with a bucket than with hose.—F. W. STONE."

"Where the coke is drawn from the retort to the retort house floor, the bucket is the better; by using a hose it gets into the men's way, and, owing to the constant steaming, is very liable to be the means of scalding the man who is charging.—W. A. ALDRICH."

"With buckets, as the water can be scattered to better advantage.—A. F. REITEMEYER."

"I have found by experience that coke can best be quenched by using a bucket.—JOHN J. POWER."

"With a bucket. Water can be spread better with a bucket than with a hose, so it will take less water and less time.—E. C. FLEGER.

"Bucket.—M. T. WALKER."

No. 16. "How should steam be conducted about a works for minimum condensation and economy, underground or overhead?"

"Overhead, if the pipes are properly covered.—E. C. FLEGER."

"With properly insulated steam pipes, it is best to conduct them overhead in and around a gas works.—JOHN J. POWER."

"The best way to conduct steam about the works is underground, because there will be less condensation and radiation.—C. W. WALLACE."

"The minimum condensation is obtained by running our steam lines underground, but we find that ease of running and of detecting leaks in the overhead system makes the latter the more economical way of having the lines.—W. S. BALDWIN."

"Conduct the steam about the works where practicable; when overhead, cover the pipes, and protect covering from moisture.—CHAS. F. CATTELL."

"Steam can be conducted about the works, by either overhead or underground pipes with equal loss, provided the overhead pipes are properly covered with asbestos or felt covering, and the underground pipes are properly similar to heating pipes. In most works it is necessary to run part of the pipes overhead and part underground.—ALTON LIGHT & TRACTION CO."

"In my opinion this depends somewhat on the general design of the works. I hold, that wherever it can be done, steam pipes should be so located that they are out of the way as much as possible, but not so much so as to be inaccessible for repairs or changes. Consequently, they should be above ground and covered with a good sort of pipe covering, or else they might be put along with water and gas service pipes used at the works, in suitable conduits with readily removable covering just under the floor. We might say that, in a well designed works, such of the pipes that can be put underground should be so placed; but this should be in readily accessible conduits, and the balance of the pipes should be overhead, but well covered with insulating material.—FREDERIO EGNER."

"Steam can be conducted about a works with a minimum condensa-

tion and economy by covering the overhead pipes with a mineral wool or moulded covering, with an extra thickness of canvas coated with two coats of tar boiled down to the consistency of soft pitch, with a little slate flour, slaked lime or hydraulic cement added to it and applied hot with a brush; the second coat to be applied 2 or 3 days following the first. For underground steam pipes the best and most serviceable way is to inclose them in a pipe made of wood, such as those used in various parts of the country for water pipes, or if they are too expensive inclose the pipes in a wooden box filled with sawdust, well packed around the steam pipes.—ROBERT WATT."

"Overhead. Pipes should be covered with some good pipe covering Reference: *Journal of Gas Lighting*, 1886, pp. 280, 329, 373 and 511.—E. M. OSBOURNE."

"Overhead, but with proper covering, that the piping may be easily gotten at for repairs.—B. C. COBB."

"Steam pipes should be in sight wherever possible, but wrapped. The placing of steam pipes underground is a necessity in most works, but in all cases the pipes should be well protected in order to keep the condensation down.—W. A. ALDRICH."

No. 17. "Are there any plants in successful operation for manufacturing water gas, using oil entirely and no solid fuel? Where are they located?"

"Oil is used entirely for manufacturing water gas at Stockton, Cal., and Fresno, Cal.—E. C. WHITE."

"On the Pacific Coast there is a constantly increasing number of plants making 'oil gas,' wherein oil is the exclusive fuel. The Monterey County Gas and Electric Company operates a Lowe oil gas plant at Monterey, and a Hoyt convertible oil and water gas plant (operated only as an oil gas plant) at Salinas.—PHILO JONES."

"San Jose, Redwood, Los Gatos, Hanford and Watsonville (Cal.) are using straight, oil gas apparatus.—HENRY I. LEA."

"Yes; at the 44th street station of the Consolidated Gas Company, New York.—W. E. BROWN."

"Our plant is a water gas plant, making gas from oil alone, turning out 40,000 per day. We consider it a success.—F. A. CRESSEY, JR."

"The Los Angeles (Cal.) Lighting Company is successfully manufacturing about 3,000,000 cubic feet of gas per day, using only oil in generators.—W. B. CLINE."

No. 18. "How much oil is required to replace the solid fuel in manufacturing water gas, using oil entirely?"

"From 12 to 13 gallons of crude oil, from 14 to 21° B. per 1,000 cubic feet of gas for heating, and making are consumed in our Hoyt plant. About 32 per cent. of this is used in the heating or blast.—PHILO JONES."

"About 8 gallons of 18° gravity oil for gas making, and about 1 gallon of 14° gravity oil for heating generators, is required per 1,000 cubic feet of gas made.—W. B. CLINE."

No. 19. "What changes are necessary to better adapt gas bench furnaces to the use of coal?"

"Coal for fuel in plain furnaces can be used in any good bench with a little alteration, but it will require much attention and labor to keep up good heats. Almost any arch can be remodeled at a small cost, and a properly constructed furnace for burning a cheap grade of coal built in the same arch. I do not care about referring to styles of construction, as I might drift too much into 'shop talk.'—JOHN DELL."

"With benches of 9's I would recommend that the combustion chamber be enlarged, the nostril or outlets from the furnace into the combustion chamber be made larger, and, instead of the chimney's outlets being just above the stack, they should extend above the roof separately, or one large stack, acting for 6 benches, 3 on each side, connected by a breeching. This will insure better draft and will also carry the smoke coming from a fresh charge of coal in the furnace out of the house.—J. T. MASON."

No. 20. "What agent can be used for analyzing crude gas which will absorb the ammonia and will not remove any of the other constituents of the gas?"

"None.—HOWALD E. MANN."

"A comparatively simple method of testing for ammonia in the crude gas is as follows: Referring to the accompanying sketch, a small, accurate dry test meter is connected to the gas supply, and the gas turned on; after passing through the meter the gas is led through a flask containing a boiling solution of $Ca(OH)_2$. The $Ca(OH)_2$ will remove any CO_2 which may be contained in the gas forming $CaCO_3 + H_2O$ and H_2S, which may be present, will unite to form $CaS + 2H_2O$, and the ammonia will be taken up and absorbed by the water forming NH_4OH, which is broken up by the application of heat and NH_3, driven off with the boiling. The ammonia and vapors pass off through the condenser, and a large part is caught in the receptacle at the bottom of the crooked tube. The NH_3, which is not caught with the condensed steam, passes on up through the crooked glass tube, where it comes into contact with the standard acid solution which is dripping down from the measuring glass above, forming $2(NH_4 + H_2SO_4 = (NH_4)_2SO_4 + 3H_2O$. After running a certain quantity of gas through the apparatus and driving off all of the ammonia from the flask, the crooked glass tube is washed down with H_2O, and, after noting the quantity of gas passed and the amount of standard solution used, the receptacle is removed from the containing vessel, and just sufficient of a standard solution of CaOH added to neutralize the solution. This is determined by adding just sufficient of the base to change a piece of red litmus paper, which has been placed in the solution, to blue. The containing vessel for the standard acid solution being accurately graduated, a means is given for determining the amount of $(NH_4)2SO_4$ in the receptacle, and from this the amount of NH_3, which, when compared with the amount of gas used, gives the percentage of NH_3 in the gas under consideration.—C. H. WILLIAMS."

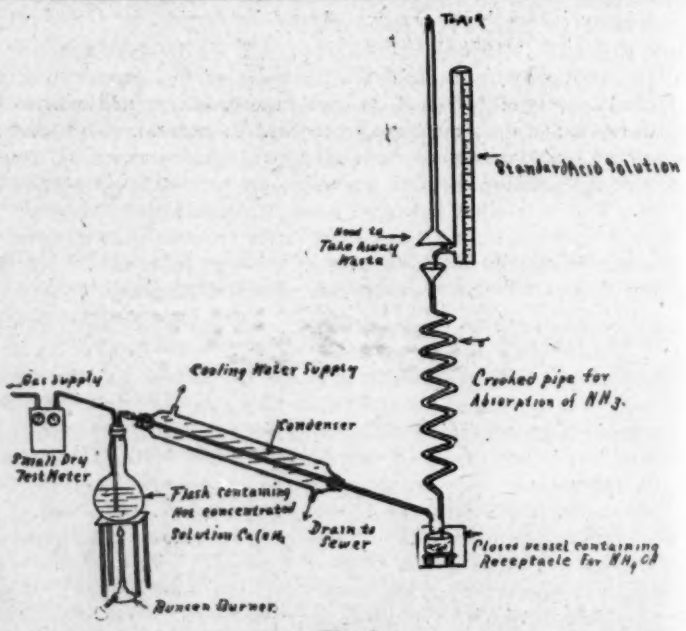


Fig. 1.

"Small bits of pumice stone saturated with syrupy phosphoric acid are usually recommended for the absorption of ammonia in crude gas and should be the first absorption made.—WALTER M. BLINKS."

"Diluted sulphuric acid.—DONALD DAVIDSON."

"There is no agent that I know of for absorbing the ammonia from crude gas that will not remove any of the other constituents; but if the per cent. of ammonia is what is wanted, what difference does it make if other bodies are removed so long as the total ammonia in the crude gas can be determined.—W. B. CALKINS."

"For this purpose I use a very dilute sulphuric acid that has been previously saturated with gas.—CLARENCE S. LOMAX."

No. 21. "How many grains of sulphur in the finished gas can be considered permissible with good practice?"

"Twelve to 15 grains per 100 cubic feet.—HOWARD E. MANN."

"From 10 to 15 grains of sulphur other than H_2S per 100 cubic feet.—ROBERT LINDSEY."

"In order to make gas as free as possible from all objections as to injury to health, vegetable life, fabrics and building materials (which result is necessary in competition with electricity), I consider that 7 grains of total sulphur per 100 cubic feet is possible and, therefore, should be considered good practice.—CLARENCE S. LOMAX."

"Not over 12 grains per 100 cubic feet of gas.—K. M. MITCHELL."

"Newbigging's Handbook states that 22 grains per 100 cubic feet is the maximum allowed, but none of that shall be sulphuretted hydrogen (H_2S).—FREDERIC EGNER."

No. 22. "According to text books the finished gas contains about 20 grains of H_2S in ordinary practice. Is it not possible to r

move all of the H_2S by use of iron oxide alone, and if not, what is the least amount which can be secured in the finished gas with the use of only iron oxide for purification?"

"In our practice the H_2S in the finished gas is never more than a trace, and as a usual thing no reaction for H_2S can be obtained at all. —HOWARD E. MANN."

"It is possible to remove it all with iron oxide.—DONALD DAVIDSON."

"The questioner states that, 'according to the text books, the finished gas contains about 20 grains of H_2S in ordinary practice,' which is wrong, for it is of sulphur compounds *other than* sulphuretted hydrogen to which this allowance of 20 grains refers. The oxide of iron will or can remove, under proper manipulation, all the H_2S.—FREDERIC EGNER"

"This question is evidently a misprint or a misapprehension. Oxide of iron will remove everything but the faintest trace of H_2S.—CLARENCE S. LOMAX."

No. 23. "How can the low temperature of the gas in the standpipe be explained in view of the fact that it issues from a retort heated to 2,000° F.?"

"The low temperature in the standpipe is due to the absorption of large quantities of heat by the volatile products of the coal in assuming a gaseous condition, the heat becoming latent.—WALTER M. BLINKS."

"As the gases and vapors pass from the retorts they are still undergoing rapid chemical changes, the supporting of which requires a large amount of heat. The only heat which is available is that within the gas itself, and as the quantity required is large, and the specific heat of the gas relatively small, the change in temperature is rapid and very marked.—C. H. WILLIAMS."

"It does not issue from a retort at 2,000° F.—V. F. DEWEY."

"As gas is a poor conductor of heat, and say it leaves the retort at 2,000° F., its temperature will naturally drop instantly as soon as it comes in contact with the standpipe, as the standpipe is exposed to the outer air. Therefore, the heat that is absorbed by the standpipe naturally radiates; consequently it is kept always at a low temperature. —C. A. LUTHER."

"The low temperature of the gas in a retort standpipe is accounted for by the fact that, while the retort itself actually has a temperature of 2,000° F., the coal itself does not attain that temperature until near the end of the charge, and a large part of the heat of the retort is taken up in the chemical changes of distillation and expansion of the solid materials into gases —CLARENCE S. LOMAX."

"Charging a retort causes a sudden lowering of the temperature, the gas passing up the standpipe before it has time to get heated. If the charge is left in long after the gas has been thrown off the temperature will rise in the standpipe and stopped pipes will be the result.—W. E. BROWN.

"The low temperature of the gas in the standpipe is due to the latent heat of vaporization and to the contact of the gas with the comparatively cool portions and particles of tar.—J. WALLACE SHAEFFER."

"The low temperature of the gas in the standpipe, about 150° F., as compared with the high temperature of the gas in the retort, about 2,000° F., is due principally to the rapid absorption of heat by the volatile constituents of the coal in assuming the gaseous form. This heat is latent in the gas in much the same manner as it is latent in steam. See 'Mentor' on 'Self-Instruction in Gas Manufacture.' A portion of this heat is also lost by radiation.—W. M. SITES."

"The standpipes are surrounded by cold air which acts in the same capacity as a cooler or condenser.—E. C. FLEGER."

"The loss of heat (or preferably temperature) is due principally to the amount of heat rendered latent in the transmutation of so much matter from the solid to the gaseous state. Euchene (Paris, 1900) found that the temperature of the volatile products (gas, tar, etc.), in the mouth of the retort, just above the coke, was 1,222° F. Part of this (the writer thinks) must be regarded as heat radiated from the coke and the walls of the retort, as Euchene found that in the standpipe between 7 and 8 inches above the mouthpiece the temperature had fallen to 800°. Heat is lost in the mouthpiece and standpipe: (1), By radiation; (2), by expansion in an ascending column; and (3), by the breaking up of some of the heavier hydrocarbons which probably does not cease after leaving the retort.—JAMES FERRIER."

"This must be due to the large amount of latent heat absorbed by the coal in volatilizing. The coal does not become nearly as hot as the retort until almost all the gas has been given off. This is much the same as a kettle of water on the fire. The fire is very much hotter than the escaping steam.—DONALD DAVIDSON."

"Several of the above answers are correct, but by example might be made more plain to the non-technical reader. The low temperature of the gas in the standpipe has puzzled many inexperienced men. The largest factor in fixing this low temperature can probably be best explained by comparing it with the application of heat to water. No mater how much or what the intensity of heat is applied to water, its temperature will depend entirely upon its pressure. An excess of heat will simply cause a larger amount of water to assume the form of steam, thus absorbing the excess of heat supplied. The conditions in a retort are probably not greatly different from this. Much of the bituminous matter of coal would have a natural condition of a vapor or a gas at a temperature very much lower than the temperature of the retort, and when taking the gaseous or vapor form, its thermal capacity would increase enormously and the excess of heat would be thus absorbed, leaving the temperature of the mass much lower than its surroundings and without sufficient time contact with the sides of the retort to take even approximately their high temperature.—EDITOR."

(To be Continued.)

Electric Light and Power Plants in Connection with Ice Plants.

In a paper on this subject, read by Mr. C. L. Wakefield, before the Boston Convention of the National Electric Light Association, the author said: I offer an apology, to begin with, for approaching a subject of this kind with so little data, and practically all that I am about to say is based upon my own experience. Correspondence with about 50 plants, supposed to be operating ice and power plants together, resulted in showing that very few were actually doing so, and these, with three exceptions, without purpose—by accident, as it were. It is strange how many operate by accident, which proves how long suffering is the "Great Architect." I recommend that the association try to have careful data kept for the coming year on this subject and have the results tabulated.

It can be accepted as a general proposition that anywhere south of that much heard of Mason and Dixon's line, electric lighting and power plants can be operated in combination with ice making plants, where steam is the motive power, advantageously to both industries.

To many members of this association the art of making ice is probably entirely unknown; therefore, I beg your indulgence to state briefly: Ice is made by the rarefaction of gases or the evaporation of liquids in inclosed pipes, the heat effort necessary to do this work being taken from a surrounding medium, a non-congealing heat conductor, which in turn gets its heat from water, in cans or on plates, which it is desired to have frozen.

Distilled water is generally used for making ice, for the sake of purity and clearness of appearance; more especially the latter. This water is distilled from the steam exhausted from the ammonia pumps where the compressor system is used, and from separate distilling apparatus where the absorption process is used. Nearly all modern ammonia pumps will freeze 20 per cent. more water than their exhaust will furnish, and as the absorption process requires a separate distilling apparatus all the water that can be obtained from other sources is an advantage easily seen.

Distilled water must be kept by itself, as any mixture, however slight, with undistilled water will cloud the ice. It is also true that the water must be kept as free of air as possible. Nevertheless, it is practicable to take distilled water from a pipe condenser maintaining a vacuum at the same time.

As to the question of labor: We opened a 300 kw. alternating current plant with the addition of one oiler and one fireman more than our regular force. We were operating this in connection with a 100-ton ice making plant of a compressor and can system.

It is, of course, not good business to start such industries except where a market is already prepared or on ground that will yield to the plow, but with these conditions in the right shape, the advantages of the combination suggested are seen to be: 1. The employment of labor for the year around that would otherwise have little to do, but still must be kept on hand. 2. A saving in the use of water that would otherwise go to waste. 3. A saving in the condensation in steam pipes

and headers, which can be almost constantly employed. 4. The steady load on boilers, with the advantages of which you are all familiar; and upon this point the following is true:

In the warmer climates all business houses close early and people sit much out of doors in the summer time. The load on the electric machines, therefore, is very light; in our experience not much over half in summer what it is in winter, and not more than one-fourth in quantity and length of time. When the load on the ice plant increases as the summer advances, and decreases as the winter comes on, it is also practicable to slow down or close down the ice machines for a short period during the peak of the load on the electric plant.

I believe it entirely practicable to operate the ammonia and water pumps electrically so as to give a more even load on the generators.

I have found it much easier to get an engineer posted in electricity than one who could operate an ice plant. Electricity seems to present so many possibilities to the imagination that men seek to follow that trade, both as to theory and practice, who should be writing "fairy stories" on other subjects. I present this as one of the minor difficulties in the way of these combinations.

The fuel cost per ton of ice has a wide range; from 350 pounds to 700 pounds of coal being necessary, depending, of course, upon the calorific value of the fuel and manner of its use.

The value of cold storage plants and the necessity for their existence in the South are being slowly grasped, and these offer a still larger field for growth and additions to both ice and electric plants.

The only hope I have in presenting this short paper is that it may stimulate more patient investigators than myself to examine this question, bringing to the work a scientific knowledge of both industries, which I do not possess.

Jug Handled Labor Agreements.

Iron Age says while there are a number of instances in which labor unions have agreed to accept reductions in wages in conformity with the reduced earnings of their employers, there are many unions that have not progressed sufficiently far in principles of justice and equity to accept their share of the present depression. Indeed it might almost be taken as a rule, just enough exceptions to give added proof, that a labor agreement is good only so long as it gives something to the unionist that he could not get without it and that labor agreements are broken the moment the agitators of the union believe that they can win additional advantage by violating their promises. A noteworthy case of direct violation of their signed agreement is on the part of Franklin Union No. 2 in the printing craft in Chicago.

When the time comes for a union to renew its annual agreement in almost every case the plan of the union managers is to demand vastly more than they ever hope to secure, and then "arbitrate" on the basis of a small advance in wages and a small curtailment of hours compared with the year previous. In this way year by year the unions have gained for themselves temporary victories.

In Chicago a conflict has just been precipitated between the Internation Association of Machinists and the Metal Trades Association, which numbers all the leading employers of machinists in that city. The employing association, prior to the expiration of the 1903–1904 contract, represented to the union that earnings were so greatly curtailed that it would not be possible for them to operate their business on the old scale of wages and asked the union to consider either a horizontal cut of 10 per cent. in their wages or to waive the minimum wage. Instead of offering to submit the matter to arbitration and finally accepting a small decrease in wages, following their own precedent when demanding an increase, the unions formulated a demand for an increase in wages, hoping to compromise on the basis of last year's proposition. This compromise would have been acceptable to the Chicago employers had it not been for the fact that the minimum wage regulation in force in Chicago placed that city at a disadvantage as compared with neighboring cities, because at nearby competing points work requiring only semi-skilled labor was paid a much lower scale than was in force in Chicago. On this point the strike was called and it is to decide it, nominally at least, that the battle will be waged.

It is difficult to conceive of a greater piece of folly on the part of the unions than that of precipitating a strike at this time, when men of intelligence know that their employers are having a hard fight for mere existence and when half the shops in Chicago could be closed down and yet leave sufficient equipment to turn out the work called for under present business conditions. Fortunately for Chicago the Metal Trades Association is an organization that has been tested before, and has given proof of a spirit of loyalty that will prevent any of its members from weakening even if their immediate self interest might be furthered by proving traitor to the organization at large.

There can be but one ending to this strike under present conditions—the defeat of the unions and the inauguration of the "open shop."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. A. C. Swain has resigned the position of Manager of the Citizens Gas Company, of Kankakee, Ills., to accept a responsible place with a concern whose headquarters are in Chicago, Ills. Mr. Swain assumes his new duties the 15th inst.

The afternoon of May 31st was memorable for a pleasant gathering of the employees of the Houston (Tex.) Gas Light Company brought together for the purpose of saying good-by, in fraternal fashion, to Mr. T. D. Kehoe, who was during the proceedings made the recipient of an umbrella that he will carry while rain threatens to fall. Perhaps we had better let our special correspondent tell the story, which he does as follows: "Mr. Kehoe was the bookkeeper of the Company since 1890, and yesterday (May 31) severed his connection with the concern to accept a position with the S. D. Colton Company, of Houston, insurance agents. The appreciation of the work of Mr. Kehoe with the Houston Gas Light Company was enthusiastically demonstrated on the 31st of May when all its employees were gathered in the general offices at the presentation to him, by Mr. J. H. Fitzgerald, of the rain protecting memento. Mr. Fitzgerald, who as almost every gas man knows is the superintending genius of the Houston Company, in these words offered the token of esteem: 'Mr. Kehoe, on the eve of severing your connection with the Houston Gas Light Company, which has endured for so many years, your associates have assembled here to express the sentiments of good will they bear you and their best wishes for your success in your new field of endeavor. That your advancement is well deserved, and that you will discharge the duties of your new position with ability and satisfaction, we who are familiar with your courtesy, tact and good judgment, can have no misgivings. We all know that in life's pathway there are stepping stones and stumbling blocks, and we hope and trust it may be your fortune to reach many of the former and to miss all of the latter. As a token of their regard they have delegated me to present you this umbrella and assure you that the sentiments going with it are as pure as the gold on the handle.' After the conclusion of Mr. Fitzgerald's talk Mr. Kehoe thanked those who had presented the present and said in a few well chosen words that he appreciated the honor, etc. Everyone connected with the Company personally announced his regret of the withdrawal of Mr. Kehoe, and in all manner showed their hearty wishes for his future welfare. After the conclusion of the presentation, the men joined together and enjoyed refreshments for some time, after which they dispersed for their homes."

The Superintendent and Engineer of the Toledo (O.) Gas Light and Coke Company, Mr. Charles R. Faben, has planned an elaborate extension of the mains of the Company to and through certain residential districts which have for "many months" been under the control of the electric lighting suppliers. There's more than natural gas in Toledo.

The official organization of the Sherman (Tex.) Gas and Electric Company has been thus proclaimed: J. F. Strickland, W. R. Buffer, C. N. Roberts, R. B. Sticker, O. Goodwin, M. B. Templeton and J. L. Penn.

The Baltimore (Md.) County Commissioners have amended the franchise, granting to Joseph Schreiber the right to lay gas mains in Highlandtown and Orangeville, so that the agreement may be enjoyed by "Schrieber, his heirs, personal representatives, and his assigns," instead of confining the same to Schreiber individually. Good thing for Schreiber.

Prof. T. S. C. Lowe seems to be involved in trouble over certain matters that have been accumulating against his interests in Los Angeles, Cal. "His" venture on the southeastern shore of Long Island, N. Y., looks like more trouble for him and the people who listened to his gaseous, coke dreams.

Those interested in the Los Angeles end of the chapter may find instruction thereon in the San Francisco *Graphic*, dated May 28th last.

ADVICES dated Mystic, Conn., June 3d, are to this effect: "The Westerly Gas and Electric Company, of Westerly, R. I., has acquired the Mystic Electric Light Company and the South Shore Electric Light Company, of Mystic. Possession will be taken immediately. The transaction will terminate some interesting litigation which is pending. The Westerly concern, which is a Rhode Island corporation, has been extending its service into the Connecticut town of Stonington. The Mystic Electric Light Company contended that its own charter rights in the town of Stonington were invaded and trespassed upon by the action of the Westerly Company. Accordingly the Mystic Company recently instituted legal proceedings to have the Westerly Company ousted from Connecticut. The Directors of the Westerly corporation canvassed the situation and came to the conclusion that the wisest solution would be to absorb the Mystic concern."

"R. L. C.," WRITING from Montreal, Can., under date of the 3d inst., says: "The third annual meeting of the Montreal Light, Heat and Power Company, which was held the 1st inst., was marked by an important statement made by the President, Mr. Herbert S. Holt, regarding the probable purchase of the gas plant by the city. Mr. Holt said that the Company was always prepared to carry out its contract with the city, but that no officer of the city had ever seen himself or any of the Directors of the Company regarding the purchase. Instead, the city authorities had gone straight to the Legislature and asked that the present contract be broken. This the Company felt justified in opposing. If the arbitration was settled on the same basis as two plants had been sold to municipalities in England, Montreal would have to pay between 11 and 12 millions for the local plant. He expressed the opinion that if the city ran the gas plant as it did everything else, the price of gas would be double what it is at the present time. In commenting on the annual report, Mr. Holt said the Company was getting very near the position where it would be able to operate at a minimum cost. The prospects were most satisfactory for a good increase in gross earnings next year, and a better increase in net earnings. The Company would have to make a large expenditure in the electrical as well as in the gas departments, but these would show good returns. The annnal election resulted in the following selection of officers: Directors, H. S. Holt, W. Mc. Walbank, R. Forget, L. J. Forget, R. Mackay, C. F. Henshaw, H. B. Rainville and H. M. Allan; President, Herbert S. Holt."

AT a special meeting of the Directors in the Toledo (O.) Gas Light and Coke Company the following action was taken respecting the death of Mr. George W. Davis:

"*Whereas*, This Board has learned with deep regret of the death of Mr. George W. Davis, who became a Director of this Company, June 1, 1896; and,

"*Whereas*, The Directors desire to place on record a tribute to his memory;

"*Resolved*, That, in the demise of Mr. Davis, there has been removed from this Board an able assistant and a beloved associate, whose charm of presence has grown with his declining years, and made his companionship a source of unalloyed satisfaction. His devotion to the welfare of this Company will always be remembered by every officer and Director.

"*Resolved*, That we tender to his family our sincere and respectful sympathy, and that a copy of these resolutions be forwarded to them and that the same be published in the daily press."

MR. JOHN R. BINGAMAN has been chosen to succeed the late Mr. B. M. Bunker on the directorate of the Altoona (Pa.) Gas Company.

PRESIDENT TURPIN, of the Board of Aldermen of Richmond, Va., is moving in the matter of a reduction for gas supplied by the local Company. As the present rate is $1 per 1,000, it would seem that no reasonable warrant exists for such action on the part of the Hon. Turpin. If the chief official wants that the condition of the city be bettered, let him take a try at keeping the roadways a trifle cleaner.

ARRANGEMENTS are being made for the rehabilitation of the finances of the Canon City (Col.) Gas Company.

MR. WILLIAM OLIVER, Superintendent of the Waterloo (N. Y.) Gas Company since 1879, has resigned that position. His successor is Henry L. Cole, of Geneva, N. Y.

MR. HENRY D. WALBRIDGE has been appointed President of the Rochester (N. Y.) Gas and Electric Company, vice Mr. George W. Archer. This concern will likely hereafter be known as the Rochester Railway and Light Company. Mr. Wm. M. Eaton, Second Vice-President and General Manager of the Grand Rapids (Mich.) Gas Light Company, will, on the 15th inst., assume practical control of the gas and electric divisions of the Rochester concern.

MR. F. ENGLISH and associates have applied for a franchise to construct and operate a gas plant in Port Collins, Col.

THE Minneapolis (Minn.) Gas Light Company will extend its distributing mains this summer to the outlying district known as Prospect Park.

MR. A. L. MCCUTCHEON, of Albion, Mich., has been elected a Director in the Consolidated Gas Company, of Mendota, Ills.

THE Zenith Furnace Company, which concern is under agreement to supply illuminating gas to West Duluth, Minn., avers that the service will be commenced on or before August 1st.

THE time for closing the syndicate agreement of the Massachusetts Gas Companies has been extended until December 31, 1904.

MR. IRVIN BUTTERWORTH is to succeed Mr. William M. Eaton in the management of the Grand Rapids (Mich.) Gas Light Company.

THE San Antonio (Tex.) Gas and Electric Company is now comfortably installed in its new and commodious quarters on East Houston street.

ACCORDING to the newspapers of Chicago, the earnings of the Peoples Gas Light and Coke Company, of that city, for the 4 months ended May 31st, show an increase of more than 10 per cent. over the same period in 1903. The remarkable feature of the gain is said to lie in that the Company has not been obliged to extend its territory, or lay a single mile of new mains in accomplishing the showing. The growth is ascribed to density of the territory already served. New buildings are springing up everywhere and dwellings are being equipped with gas for illuminating and domestic purposes, which heretofore have clung to old methods. The gas arc light, the new feature which made such an admirable increase last year, is growing more popular than ever. It is estimated that the Company will install in the neighborhood of 30,000 of these lights this year.

Concrete in the Baltimore Fire.

Municipal Engineering notes that reports from various architects and engineers regarding the behavior of concrete in the Baltimore fire have been made since the last number of the magazine was issued. They all testify to the value of the material for re-isting fire, with greater or less detail.

The general average of opinions seems to be that there were not enough buildings made of reinforced concrete in whole or in part and the concrete was not subjected to sufficient heat to determine its full value. Every building in which it was used passed through the fire and can readily be returned to its original condition, and floor beams entirely covered with concrete were successfully protected from destruction.

Capt. J. S. Sewell, in his report, gives the most details regarding the action of concrete under fire. He found some spallin of concrete on square corners and some calcining of stone in concrete on the surface to a depth of about three-fourths inch. Stone concrete spalls from expansion of air in cavities in the stone. Gravel concrete does not have the cavities and is therefore better for resisting fire. Broken bricks, broken slag, ashes and clinkers make good concrete. Cinders are unsafe if they contain any unburned coal, though one floor was observed in which some coal had burned out and the floor was still safe. Locomotive cinders are condemned for concrete. If made of the best materials under rigid inspection cinders make the best floor concrete, being both light and fire resisting.

Similar results are indicated by some experiments made recently at Louisville. Temperatures were not accurately determined, but the heat was great enough to calcine the limestone used in some cubes and to disintegrate the cubes either in the furnace or on putting them in water, through the disintegration of the stone, the cement apparently retaining at least part of its strength. A cube of natural cement and cinder concrete was not injured by either fire or water so far as appearance would indicate. These experiments will be carried further.

The ability of cinder concrete floor arches to stand 1,700° heat for some time and then a stream of water was demonstrated in a New York experiment. Several other experiments indicate that both Portland and natural cement will lose strength on being subjected to heat without reference to the stone with which they are combined, but the laws of deterioration have not yet been determined. One good result of the excellent behavior of concrete in the Baltimore fire will be the inducing of experimentation that we may know what materials must be used to obtain the best fire resisting concrete.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
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OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JUNE 13, 1904.

The Market for Gas Securities.

The abnormally comfortable state of the money market has caused some trouble in the minds of the speculators who work for the short account, although all other conditions, such as the indifference of the public, decreased earnings' reports on railways account and shrinkage in building operations, favor the ways of the bears. The net result for the week was a gain in values all round, Consolidated closed to-day (Friday) at 189½ to 190, ex rights, which were in some demand at 15½ to 15¾. The trading was light, but the indications are for better prices.

Brooklyn Union is 211 to 220. The Company is rapidly putti ng itself in shape, on main extension account, to do away with the complaints of last winter over inadequate supply. Its financial condition is all that could be desired. We look for very much higher quotations for Brooklyn Union before the fall season is on. Peoples, of Chicago, moved up to 97; Baltimore Consolidated is steady at 70, and Lacledes are notably wobbly.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JUNE 13.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	189¼	190
Central Union, Bonds, 5's	3,000,000	1,000	106¼	106⅝
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	..	108	112
Mutual	3,500,000	100	270	300
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	105¼	106
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	34	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	102½	105½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109½	111
" 1st Con. 5's	1,500,000	..	106	108
Standard	5,000,000	100	125	13
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,680	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	211	220
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅜	3/16
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	3¾	4
" " Bonds, 5's	5,250,000	1,000	12¾	..
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,550,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	100¾	101¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore..	11,000,000	100	70	70¼
Mortgage, 6's	3,600,000	..	..	1:8
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99¼	100
Detroit Gas Co., 5's	951,000	1,000	75	75½
" Inc. 5's	16,000	100	98¼	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	75	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104¼	105
Hartford	750,000	25	245	255
Hudson County Gas Co., of New Jersey	10,500,000	..	67	68
" Bonds, 5's	10,500,000	..	103¼	104¼
Indianapolis	2,000,000	..	60	70
" Bonds, 6's	2,650,000	..	103¼	103½
Jackson Gas Co	250,000	50	78	75
" 1st Mtg. 5's	200,000	1,000	101	103½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	100
Preferred	2,500,000	100	75	100
Bonds	10,000,000	1,000	109¼	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	3,570,000	50	134	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108¼
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	58	58
Bonds, 6's	4,600,000	..	105	105½
New Haven	1,000,000	25	64	70
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	96¾	97
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	92	96½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's..	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047,000	1,000	94	96
Washington, D. C	2,600,000	20	28⅞	28¾
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600,000	50	230	..

Advertisers' Index.

GAS ENGINEERS. Page

A. E. Boardman, New York City 952
Baxter & Young, Detroit, Mich 952
B. E. Chollar, St. Louis, Mo 938
David Leavitt Hough, New York City 952
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
Frank D. Moses, Trenton, N. J 939
Fred. Bredel Co., Milwaukee, Wis 940
Frederic Egner, Washington, D. C 938
Geo. G. Ramsdell, New York City 937
Geo. R. Rowland, New York City 942
Humphreys & Glasgow, New York City 953
J. F. W. Jost, Philadelphia, Pa 937
Kerr Murray Mfg. Co., Fort Wayne, Ind. 952
The Gas Machinery Co., Cleveland, O. 940
The Jeffrey Manufacturing Co., Columbus, O. 950
The Western Gas Construction Co., Fort Wayne, Ind... 960
United Gas Improvement Co., Philadelphia, Pa. 947
Wm. Henry White, New York City 955

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, New York City 952
Bartlett, Hayward & Co., Baltimore, Md. 953
Baxter & Young, Detroit, Mich 952
Connelly Iron Sponge and Governor Co., New York City 949
Continental Iron Works, Brooklyn, N. Y. 954
Cruse-Kemper Co., Philadelphia, Pa. 939
Davis and Farnum Mfg. Co., Waltham, Mass. 952
Deily & Fowler, Philadelphia, Pa. 956
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
Frank D. Moses, Trenton, N. J 939
Fred. Bredel Co., Milwaukee, Wis. 940
J. Shepard Page's Sons, New York City 952
Humphreys & Glasgow, New York City 953
Isbell-Porter Company, New York City 954
Kerr Murray Mfg. Co., Fort Wayne, Ind. 952
Lloyd Construction Co., Detroit, Mich. 942
Logan Iron Works, Brooklyn, N. Y. 956
Quintard Iron Works, New York City 953
R. D. Wood & Co., Philadelphia, Pa. 954
Riter-Conley Mfg. Co., Pittsburg, Pa. 955
Stacey Mfg. Co., Cincinnati, O. 955
The Connersville Blower Company, Connersville, Ind... 957
The Gas Machinery Co., Cleveland, O. 940
The Jeffrey Manufacturing Co., Columbus, O. 950
The Western Gas Construction Co., Fort Wayne, Ind.... 960
United Gas Improvement Co., Philadelphia, Pa. 947

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. 953
B. E. Chollar, St. Louis, Mo. 938
Economical Gas Apparatus Construct'n Co, Toronto, Ont. 944
Fred. Bredel Co, Milwaukee, Wis. 940
Humphreys & Glasgow, New York City 953
The Gas Machinery Co., Cleveland, O. 940
The Western Gas Construction Co., Fort Wayne, Ind.... 960
United Gas Improvement Co., Philadelphia, Pa. 947

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N.Y. 954
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
Fred. Bredel Co., Milwaukee, Wis. 940
Kerr Murray Mfg. Co., Fort Wayne, Ind. 952
Logan Iron Works, Brooklyn, N. Y. 956
R. D. Wood & Co., Philadelphia, Pa. 954
Riter-Conley Mfg. Co., Pittsburg, Pa. 955
Stacey Mfg. Co., Cincinnati, O. 955
The Gas Machinery Co., Cleveland, O. 940
The Western Gas Construction Co., Fort Wayne, Ind.... 960

PRODUCER POWER PLANTS.

Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
R. D. Wood & Co., Philadelphia, Pa. 954

TAR AND CARBONIC ACID EXTRACTOR.

Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
Fred. Bredel Co., Milwaukee, Wis. 940
Stacey Mfg. Co., Cincinnati, O. 955
The Gas Machinery Co., Cleveland, O. 940
The Western Gas Construction Co., Fort Wayne, Ind... 960

AMMONIA CONCENTRATORS.

Fred. Bredel Co., Milwaukee, Wis. 940
Michigan Ammonia Works, Detroit, Mich. 935
The Gas Machinery Co., Cleveland, O. 940
The Western Gas Construction Co., Fort Wayne, Ind... 960

GAS METERS.

American Meter Co., New York and Philadelphia..... 939
Detroit Meter Company, Detroit, Mich..... 859
D. McDonald & Co., Albany, N.Y..... 957
Helme & McIlhenny, Philadelphia, Pa..... 939
John J. Griffin & Co., Philadelphia, Pa..... 920
Keystone Meter Co., Royersford, Pa..... 938
Maryland Meter and Mfg. Co., Baltimore, Md..... 938
Metric Metal Co., Erie, Pa..... 939
Nathaniel Tufts Meter Co., Boston, Mass..... 958

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 939
D. McDonald & Co., Albany, N. Y..... 957
Helme & McIlhenny, Philadelphia, Pa..... 939
John J. Griffin & Co., Philadelphia, Pa..... 920
Keystone Meter Co., Royersford, Pa..... 938
Nathaniel Tufts Meter Co., Boston, Mass..... 958

PREPAYMENT METER ATTACHMENTS.

Reeves Mfg. Co., New Haven, Conn..... 940

GAS AND WATER PIPES.

Davis & Farnum Mfg. Co., Waltham, Mass..... 952
Donaldson Iron Co., Emaus, Pa..... 944
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
M. J. Drummond & Co., New York City..... 944
R. D. Wood & Co., Philadelphia, Pa..... 954
Warren Foundry and Machine Co., New York City..... 944

GAS COALS.

Berwind-White Coal Mining Co., New York and Phila. 950
Perkins & Co., New York City..... 950
Westmoreland Coal Co., Philadelphia, Pa..... 951

SPECIALTIES FOR OIL AND PIPE LINES.

S. R. Dresser, Bradford, Pa..... 941

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City..... 944

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y..... 940

GAS TAPPING MACHINES.

George Light, Dayton, O..... 944
H. Mueller Manufacturing Company, Decatur, Ills..... 937

CANNEL COALS.

Perkins & Co., New York City..... 950

STOKING MACHINERY.

G. A. Bronder, New York City..... 949

CONVEYORS.

Adam Weber Sons, New York City..... 948
C. W. Hunt Company, New York City..... 941
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 944
Fred. Bredel Co., Milwaukee, Wis..... 940
G. A. Bronder, New York City..... 949
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 952
The Brown Hoisting Machinery Co., Cleveland, O..... 951
The Gas Machinery Co., Cleveland, O..... 940
The Jeffrey Manufacturing Co., Columbus, O..... 950
The Link-Belt Engineering Co., Philadelphia, Pa..... 941
The Link-Belt Machinery Co., Chicago, Ills..... 944
The Western Gas Construction Co., Fort Wayne, Ind... 960
United Telpherage Co., New York City..... 936

CHARGING BARROWS & COAL WAGONS.

Kerr Murray Mfg. Co., Fort Wayne, Ind..... 952
Stacey Mfg. Co., Cincinnati, O..... 955

GAS ENRICHERS.

Standard Oil Co., New York City..... 951
Sun Company, Pittsburg, Pa..... 951
The Sun Oil Co., Pittsburg, Pa..... 951

COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 951
Fred. Bredel Co., Milwaukee, Wis..... 940
The Jeffrey Manufacturing Co., Columbus, O..... 950

STEAM BLOWER FOR BURNING BREEZE.

The Connersville Blower Company, Connersville, Ind... 957

ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N.Y..... 942

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 942

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 949
Fred. Bredel Co., Milwaukee, Wis..... 940
Isbell-Porter Co., Newark, N. J..... 954
R. D. Wood & Co., Philadelphia, Pa..... 954

CEMENTS.

C. L. Gerould, Bloomington, Ind..... 948

RETORTS AND FIREBRICKS.

Adam Weber Sons, New York City..... 948
Baltimore Retort and Firebrick Co., Baltimore, Md..... 948
Brooklyn Firebrick Works, Brooklyn, N. Y..... 948
Henry Maurer & Son, New York City..... 948
James Gardner, Jr., Co., Pittsburg, Pa..... 948
J. H. Gautier & Co., Jersey City, N. J..... 948
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 948
Missouri Firebrick Co., St. Louis, Mo..... 948
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 938
The Kreischer Brick Mfg. Co., New York City..... 948

INCLINED RETORTS.

Adam Weber Sons (Graham, Morton [England] System) 948
Fred. Bredel Co., Milwaukee, Wis..... 940
Geo. G. Ramsdell, New York City..... 938
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 938

VERTICAL S'S.

Adam Weber Sons (Oscar B. Weber's Construction)..... 948
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 949
Fred. Bredel Co., Milwaukee, Wis..... 940
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 938

VERTICAL CHARGING & DISCHARGING MACHINERY.

Adam Weber Sons, New York City..... 948

REGENERATIVE FURNACES.

Adam Weber Sons, New York City..... 948
Bartlett, Hayward & Co., Baltimore, Md..... 958
Fred. Bredel Co., Milwaukee, Wis..... 940
J. H. Gautier & Co., Jersey City, N. J..... 948
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 948
Missouri Firebrick Co., St. Louis, Mo..... 948
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 938

SELF-SEALING MOUTHPIECE DOORS.

Continental Iron Works, Brooklyn, N.Y..... 954
Fred. Bredel Co., Milwaukee, Wis..... 950
Isbell-Porter Co., Newark, N. J..... 954
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 952
Logan Iron Works, Brooklyn, N.Y..... 956
R. D. Wood & Co., Philadelphia, Pa..... 954
Stacey Mfg. Co., Cincinnati, O..... 955
The Gas Machinery Co., Cleveland, O..... 940
The Western Gas Construction Co., Fort Wayne, Ind.. 960

CHIMNEY CONSTRUCTION.

Adam Weber Sons, New York City..... 948

INCANDESCENT GAS LAMPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 900
General Gas Light Co., Kalamazoo, Mich..... 939
Geo. G. Ramsdell, New York City..... 937
Welsbach Company, Gloucester, N. J..... 946

(*Continued on page 936.*)

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., June 8, 1904.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 15th, 1904, to stockholders of record at the close of business, June 30, 1904. Checks will be mailed.

1514-5 LEWIS LILLIE, Treasurer.

Position Wanted.

Would like to obtain a position with a gas company desirous of increasing its output by the placing of gas ranges and other appliances. Am capable of taking charge of the canvassing and sales' divisions. Prefer the former. Have had 8 years' experience and can guarantee first-class results. Am 28 years old. Can furnish any required references

1514-1 Address, "SALESMAN," care this Journal.

SUPERINTENDENT WANTED

An Eastern gas company, sending out about a million per day, wants a superintendent who can show by results in monthly reports that he understands thoroughly the manufacture and distribution of coal and water gas. To insure attention, replies should state fully age, experience, salary expected, references, etc. Address, "A. B.,"

1514-2 Care this Journal.

PROPOSALS FOR TAR.

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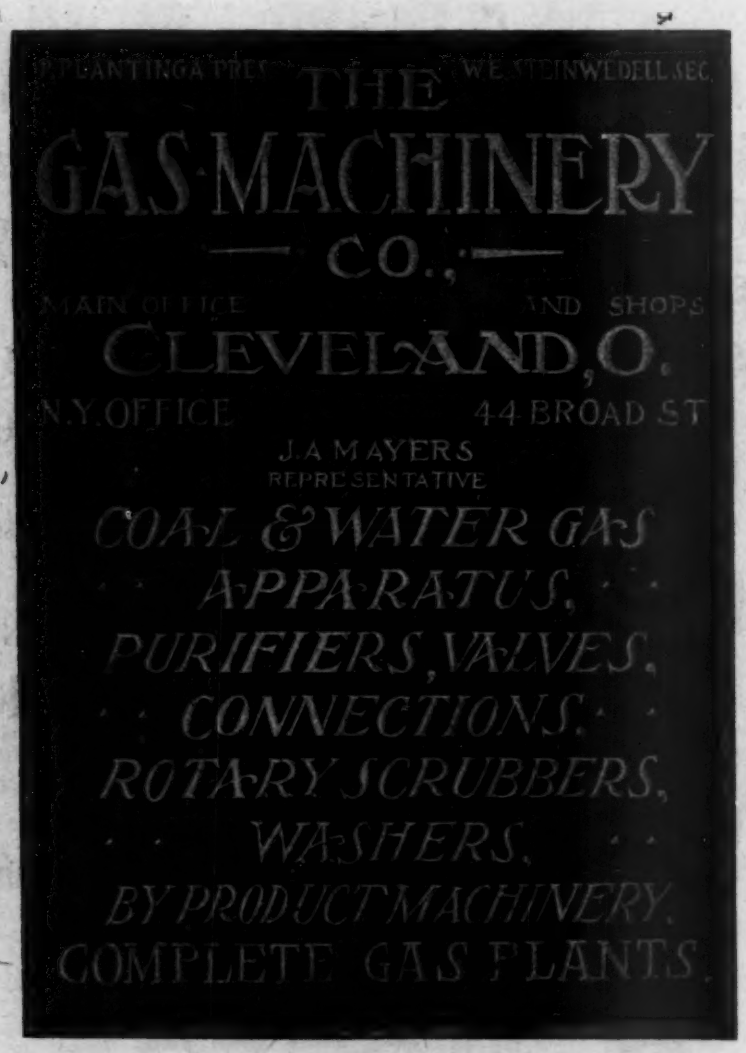

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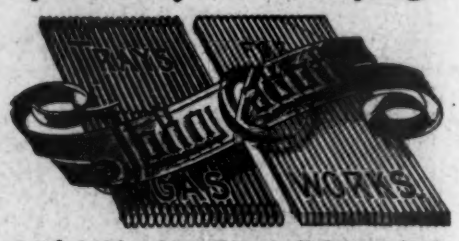

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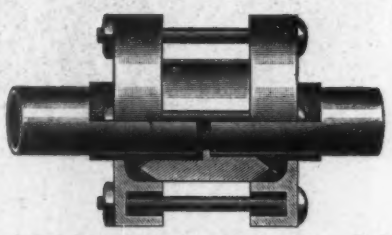

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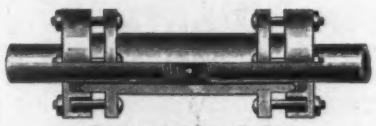

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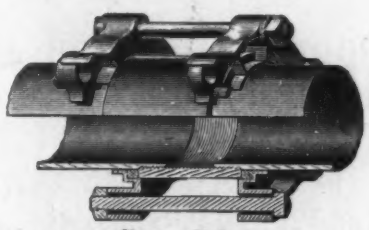

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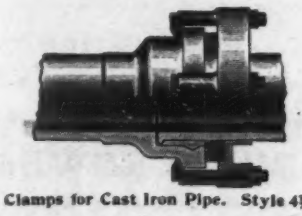

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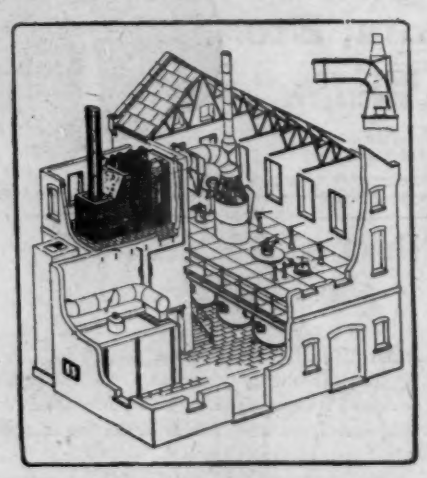

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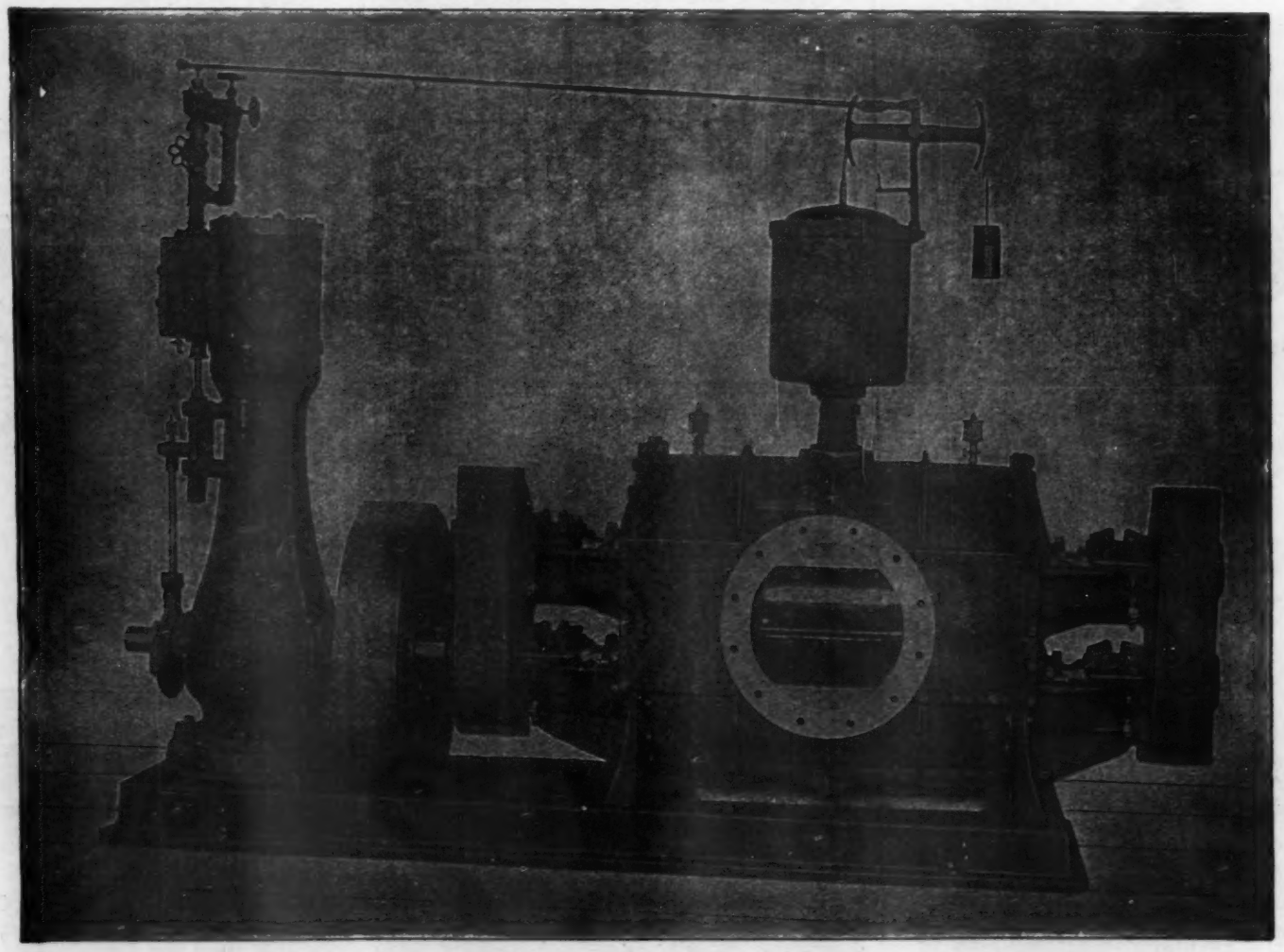

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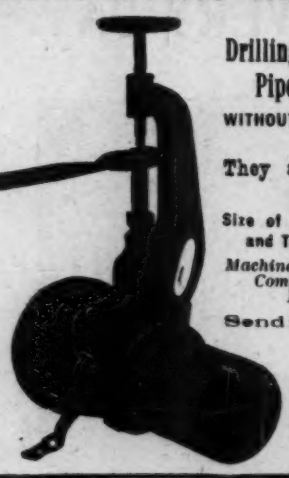

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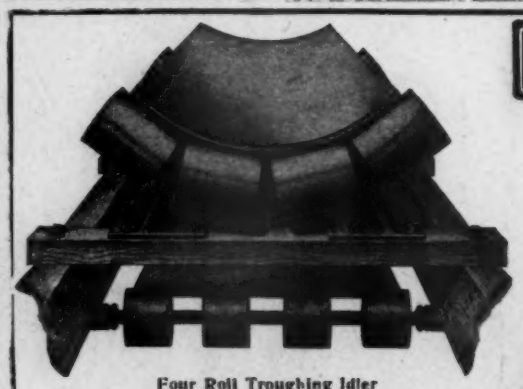

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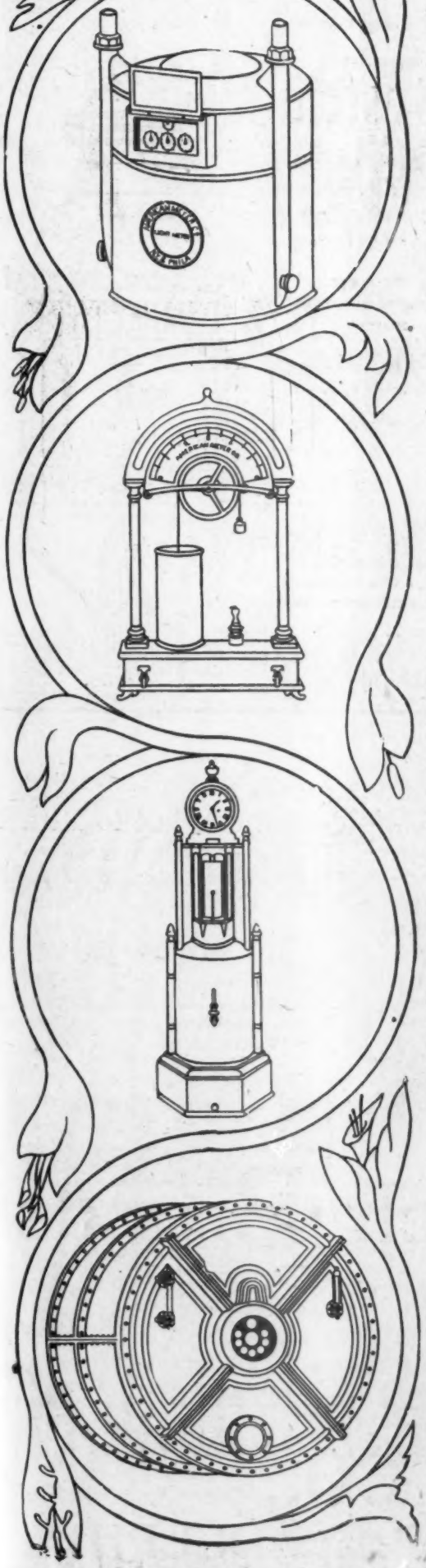

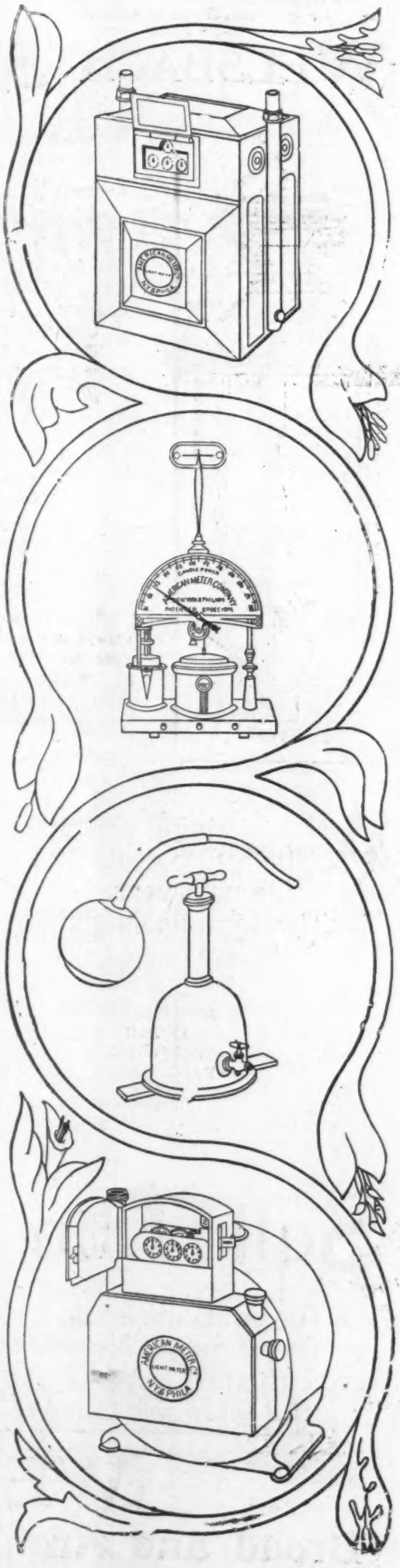

PUBLIC LIGHTING TABLE.

JULY, 1904.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Fri.	1	8.00 PM	10.50 PM	7.30	3.15
Sat.	2	8.00	11.20	7.30	3.15
Sun.	3	8.00	11.50	7.30	3.15
Mon.	4	8.00	12.20 AM	7.30	3.15
Tue.	5	8.00 LQ	12.50	7.30	3.15
Wed.	6	8.00	1.20	7.30	3.15
Thu.	7	8.00	2.00	7.30	3.15
Fri.	8	8.00	2.40	7.30	3.15
Sat.	9	8.00	3.40	7.30	3.15
Sun.	10	8.00	3.40	7.30	3.15
Mon.	11	8.00	3.40	7.30	3.15
Tue.	12	8.00 NM	3.40	7.30	3.15
Wed.	13	8.00	3.40	7.30	3.15
Thu.	14	8.00	3.40	7.30	3.15
Fri.	15	8.00	3.40	7.30	3.15
Sat.	16	8.00	3.40	7.20	3.15
Sun	17	9.30	3.50	7.20	3.15
Mon.	18	10.00	3.50	7.20	3.15
Tue.	19	10.40 FQ	3.50	7.20	3.15
Wed.	20	11.20	3.50	7.20	3.15
Thu.	21	12.00	3.50	7.20	3.15
Fri.	22	12.40 AM	3.50	7.20	3.15
Sat.	23	1.30	3.50	7.20	3.15
Sun.	24	2.20	3.50	7.20	3.15
Mon.	25	No L.	No L.	7.20	3.15
Tue.	26	No L. FM	No L.	7.20	3.15
Wed.	27	No L.	No L.	7.20	3.15
Thu.	28	7.50 PM	8.50 PM	7.20	3.15
Fri.	29	7.50	9.30	7.20	3.15
Sat.	30	7.50	10.00	7.10	3.30
Sun.	31	7.40	10.30	7.10	3.30

TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 97 Liberty Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

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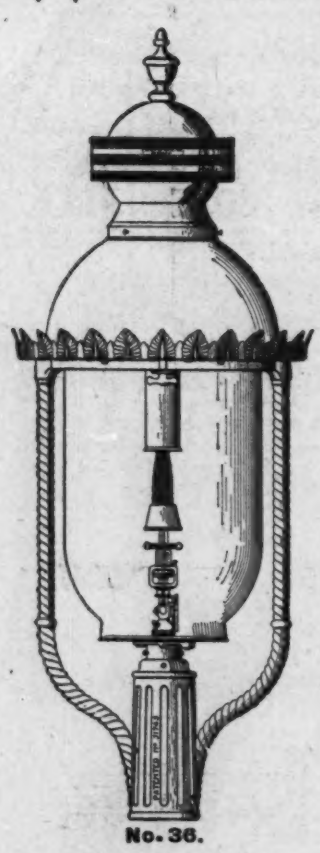
.... OF AMERICA ....



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Amesbury, Mass.	Washington, D. C.	Chicago (Ogden Co.)
Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

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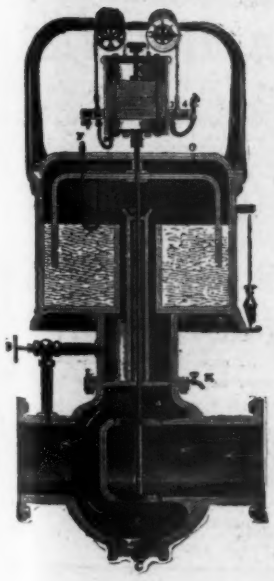

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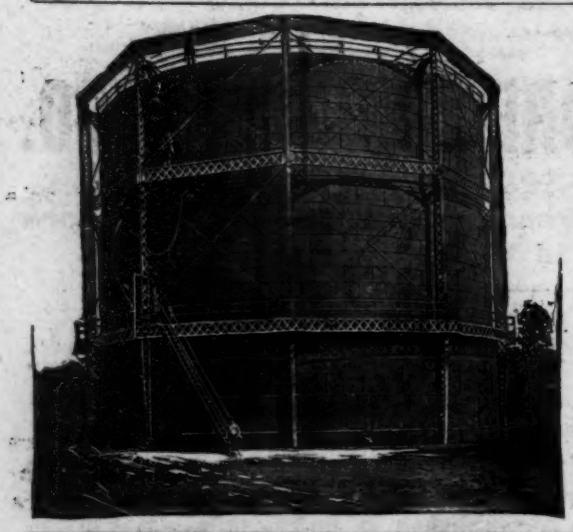

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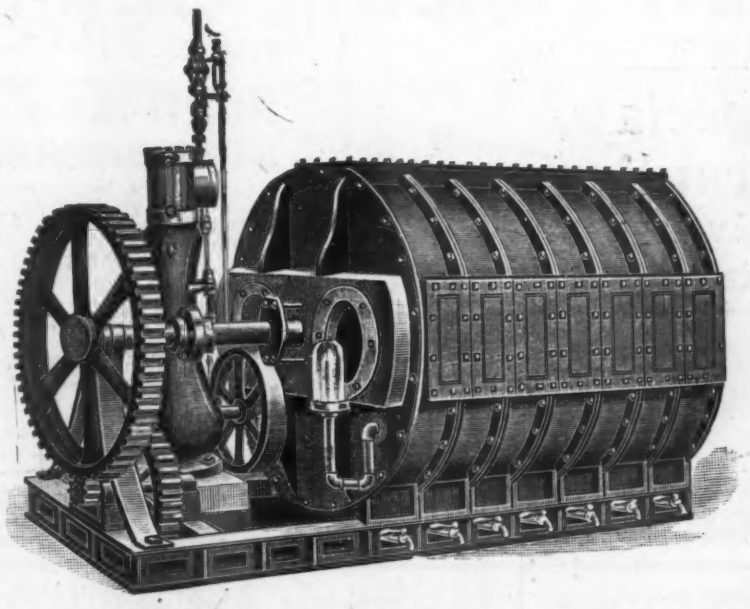

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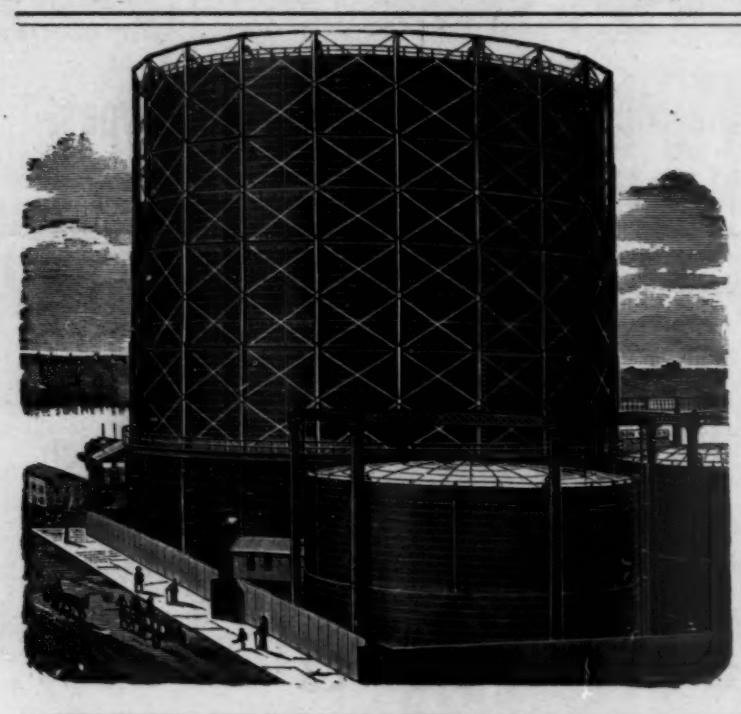

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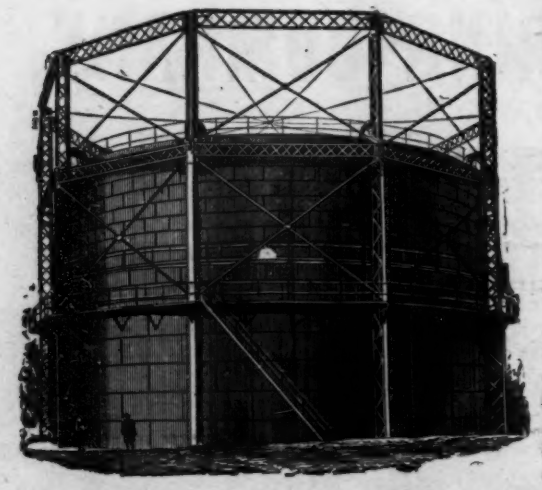

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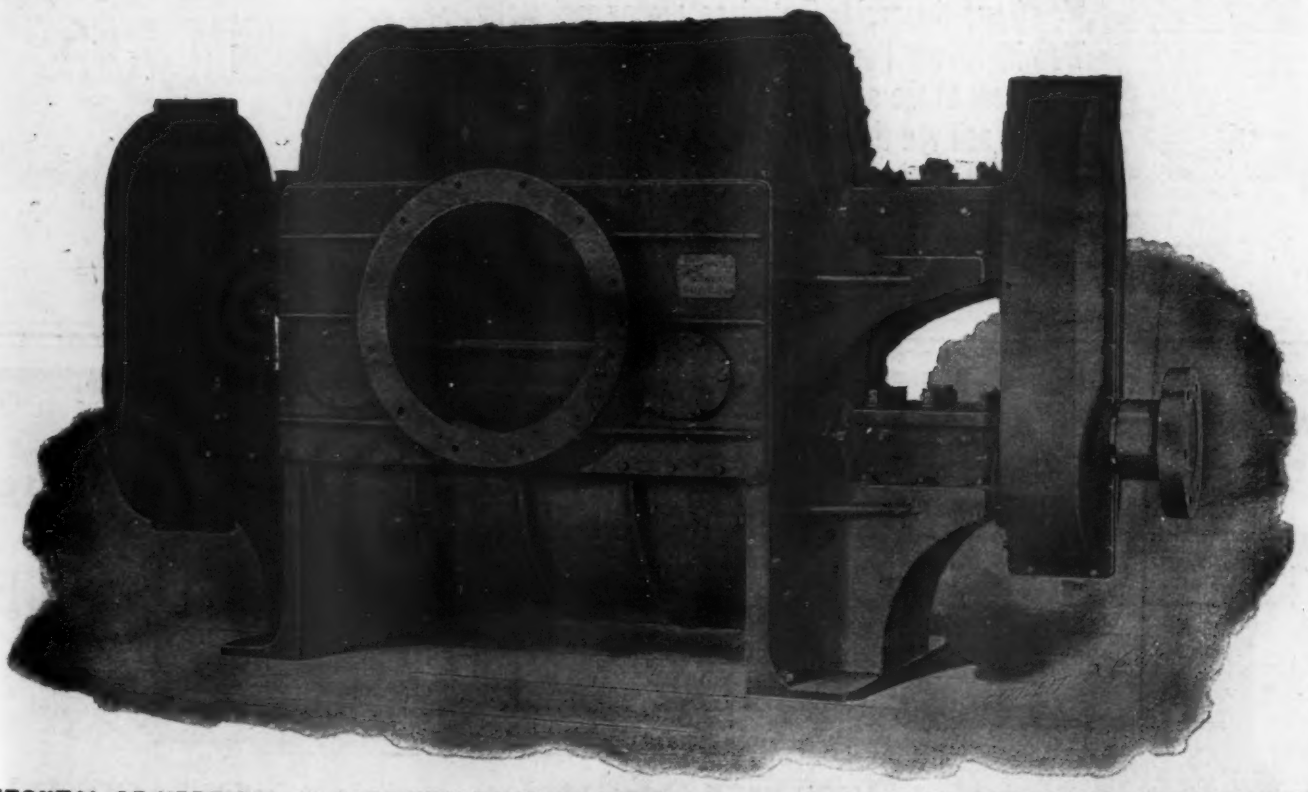

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